FAO PROJECT: CCP/INT/003/NOR



SURVEYS OF THE FISH RESOURCES OF

São Tomé & Príncipe

Survey of the demersal resources 10 May - 20 May 2010

Direcção das Pescas São Tomé and Príncipe Institute of Marine Research Norway

Bergen November 2010

THE EAF-NANSEN PROJECT

FAO started the implementation of the project "Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries (EAF-Nansen GCP/INT/003/NOR)" in December 2006 with funding from the Norwegian Agency for Development Cooperation (Norad). The EAF-Nansen project is a follow-up to earlier projects/programmes in a partnership involving FAO, Norad and the Institute of Marine Research (IMR), Bergen, Norway on assessment and management of marine fishery resources in developing countries. The project works in partnership with governments and also GEF-supported Large Marine Ecosystem (LME) projects and other projects that have the potential to contribute to some components of the EAF-Nansen project.

The EAF-Nansen project offers an opportunity to coastal countries in sub-Saharan Africa, working in partnership with the project, to receive technical support from FAO for the development of national and regional frameworks for the implementation of Ecosystem Approach to Fisheries management and to acquire additional knowledge on their marine ecosystems for their use in planning and monitoring. The project contributes to building the capacity of national fisheries management administrations in ecological risk assessment methods to identify critical management issues and in the preparation, operationalization and tracking the progress of implementation of fisheries management plans consistent with the ecosystem approach to fisheries.

LE PROJET EAF-NANSEN

La FAO a initié la mise en oeuvre du projet "Renforcement de la base des connaissances pour mettre en œuvre une approche écosystémique des pêcheries marines dans les pays en développement (EAF-Nansen GCP/INT/003/NOR)" en décembre 2006. Le projet est financé par de l'Agence norvégienne de coopération pour le développement (Norad). Le projet EAF-Nansen fait suite aux précédents projets/ programmes dans le cadre du partenariat entre la FAO, Norad et l'Institut de recherche marine (IMR) de Bergen en Norvège, sur l'évaluation et l'aménagement des ressources halieutiques dans les pays en développement. Le projet est mis en oeuvre en partenariat avec les gouvernements et en collaboration avec les projets grands écosystèmes marins (GEM) soutenus par le Fonds pour l'Environnement Mondial (FEM) et d'autres projets régionaux qui ont le potentiel de contribuer à certains éléments du projet EAF-Nansen.

Le projet EAF-Nansen offre l'opportunité aux pays côtiers de l'Afrique subsaharienne partenaires de recevoir un appui technique de la FAO pour le développement de cadres nationaux et régionaux visant une approche écosystémique de l'aménagement des pêches et la possibilité d'acquérir des connaissances complémentaires sur leurs écosystèmes marins. Ces éléments seront utilisés pour la planification et le suivi des pêcheries et de leurs écosystèmes. Le projet contribue à renforcer les capacités des administrations nationales responsables de l'aménagement des pêches en introduisant des méthodes d'évaluation des risques écologiques pour identifier les questions d'aménagement d'importance majeure ainsi que la préparation, la mise en œuvre et le suivi des progrès de la mise en œuvre de plans d'aménagement des ressources marines conformes à l'approche écosystémique des pêches.

CRUISE REPORTS "DR. FRIDTJOF NANSEN"

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CHAPTER 1 INTRODUCTION

The oceanic islands of São Tomé and Príncipe form a portion of a string of elevations extending along a geologic feature known as the Guinea Line (or Cameroon Volcanic Line), which on the African continent include the Jos Plateau of Nigera, the Cameroon Highlands, and Mount Cameroon. The Guinea Line extends into the ocean at the continental island of Bioko (formerly Fernando Poo), with the 31 million years old Príncipe approximately 220 km southwest of Bioko, and the 13 million years old São Tomé another 146 km farther south. Annobón (or Pagalu) (180 km from São Tomé) is the southernmost of this string of islands, of which the three southernmost ones are surrounded by ocean depths greater than 3000 m. São Tomé (836 km²) is much larger in land area than Príncipe (130 km²), but if measured from the shelf break, Príncipe would be somewhat larger, as the southern part of the volcanic peak that forms the island appears in bathymetric charts to form a broad shelf to depths of approximately 100 m, beyond which the bottom drops precipitously. In fact, almost two-thirds of the total continental-shelf area of the country lies around Príncipe. (Most of the data given above is from R. C. Drewes & J. A. Wilkinson, 2004. Proc. Calif. Acad. Sci. 55(20):395-407). The remoteness of these oceanic islands and the long isolation they have experienced have had pronounced effects on the composition of their biota. For example, the islands' avifauna has the highest percentage of endemic taxa in the world. Recent studies on the other groups of plants and animals have shown a similar high degree of endemism. Anuran diversity is amazingly high, considering that members of that group are among the least capable of transiting oceanic expanses, and the amount of endemism they show reflect the long isolation the islands have experienced since their births.

The survey of São Tomé and Príncipe was a follow up from the successful surveys conducted by Institute of Marine Research (IMR) and Food and Agriculture Organisation of the United Nations (FAO) in the region in 2004, 2005, 2006 and 2007 in cooperation with the Guinea Current Large Marine Ecosystem, (GCLME), FAO and IMR.

The present survey was organised by IMR and FAO under the FAO project CCP/INT/003/NOR: "Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries. This project is the continuation of a series of projects and agreements between NORAD, IMR and FAO involving surveys with the research vessel "Dr. Fridtjof Nansen".

1.1 Objectives

Following the instructions from the Direcção das Pescas, São Tomé and Príncipe and the recommendations from the pre survey meeting held onboard the vessel the main objectives of the survey were:

- to describe the distribution, composition and estimate the abundance of the main demersal fish species on the shelf by a swept-area trawl programme
- to map the general hydrographic regime by using a CTD to monitor the temperature, salinity and oxygen at bottom trawl stations and on hydrographical transects
- To specially watch out for observed dead fish of the genus Lagocephalus
- on-the-job training covering main survey routines

1.2 Participation

Participants for the survey came from:

Direcção das Pescas, São Tomé and Príncipe:

Virginia Carvalho Godinho, André Bandeira, Leonel Ferreira Nunes da Mota, Jose Dias de Sousa Lopes (local team leader) and Ilair de Conceição

California Academy of Sciences, USA:

Tomio Iwamoto

Institute of Marine Research, Bergen, Norway:

Jens-Otto Krakstad (cruise leader), Oddgeir Alvheim, Tore Mørk and Thor Egil Johansson

1.3 Narrative

The vessel left Tema (Ghana) at 18:00 on the 7th May. and continued across to the islands of São Tomé and Príncipe. Local scientists came on board in São Tomé in the afternoon of the 10th May. Príncipe was surveyed from the morning of the 11th May to the evening of 13th May before the vessel crossed over to São Tomé. The swept area survey of São Tomé was carried out from the 14th May in the morning until the 16th May in the evening. The Norwegian National day, 17th May, was celebrated at anchor at the south eastern side of the island. From the 18th May midday until the 19th May in the evening a diurnal trawl experiment was performed on two preselected stations with the purpose of inspecting the variation in fish catch size and species composition over a 24 h period. During this experiment each trawl station were trawled every 5 h throughout. The survey ended on the 20th May in the morning when the vessel arrived back in the port of São Tomé.

The bottom topography on the island limits the trawlable areas and does not allow for a fully random selection of trawl stations. Semi random swept area trawl stations using the depth zones 20-50 m, 51-100 m and when possible >100 m depth were conducted during the day while CTD lines, were carried out at night. Continuous acoustic registrations were recorded

throughout the survey. Pelagic trawling on registrations and random blind hauls was carried out during dark hours when time permitted.

CTD-stations were taken at the bottom trawl stations. In addition, hydrographical profiles were made with CTD from surface down to the bottom or 1500 m depth.

1.4 Survey effort

Figure 1.1 shows the cruise tracks with trawl and hydrographic stations.

Table 1.1 summarises the survey effort in each island. The area calculated for São Tomé and Príncipe is the total area for both islands for the depth regions surveyed.

Table 1.1Surveyed area and valid trawl stations by depth stratum (in brackets pelagic trawls), total trawl
stations separated by bottom (BT) and pelagic (PT), plankton hydrographic stations (CTD) and
distance surveyed in NM by region.

			Depth strata	(m)		,	Total		
Region		20-50	51-100	101-200	BT	PT	Plankton	CTD	Distance
Príncipe Area	(NM^2)	68	58	-					
	#hauls	4	9	-	13	2	2	36	360
São Tomé	Area (NM ²)	71	228	-					
	#hauls	2	6	-	8	4	6	47	550



Figure 1.1 Course track with fishing, plankton and hydrographic stations São Tomé and PrÍncipe. Depth contours are indicated

CHAPTER 2 METHODS

2.1 Meteorological and hydrographical sampling

Temperature, salinity and oxygen

A Seabird 911 CTD plus was used to obtain vertical profiles of temperature, salinity and oxygen. Real time plotting and logging was done using the Seabird Seasave software installed on a PC. The profiles were usually taken down to a few metres above the bottom, but not deeper than 1 500 m.

The SBE 21 Seacat thermosalinograph was running routinely during the survey, obtaining samples of sea surface salinity and relative temperature and fluorescence (5 m depth) every 10 seconds. An attached in-line Turner Design SCUFA Fluorometer continuously measured Chlorophyll A levels [RFU] at 5 m below the sea surface while underway during the entire cruise.

Meteorological observations including wind direction and speed, air temperature, global radiation and sea surface temperature (SST) were automatically logged using a WIMDA meteorological station and averaged by every nautical mile distance sailed.

A vessel-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments logged the current profiles continuously, and was set to ping synchronously with the echo sounders. The frequency of the VMADCP is 150 kHz, and data were averaged and stored in 4 m vertical bins in shallow water to approximately 400 m bottom depth and 8 m bins deeper than this.

Zooplankton

The sampling was conducted by means of HYDROBIOS Multinet with 5 nets. The nets (180 μ m) were remotely opened from the bridge of the vessel. The depth intervals covered in 2010 were: 200-100 m, 100 -75 m, 75-50 m, 50-25 m and from 25 m to the surface. In the case of stations shallower than 25 m, the sample was taken from the bottom and up to the surface. A SCANMAR depth sensor gave real-time information of the depth and a flow meter inside the net was used to estimate the sampling volume.

2.2 Biological sampling

Sampling gear

A Gisund Super bottom trawl with a headline height of about 4.5 m was used during the survey, and the doors are of the Thyborøn' combi type. The distance between the front parts

of the wings was about 21 m during deployment at a speed of 3 NM h-1. These settings have been the standard on all swept area surveys with R/V "Dr. Fridtjof Nansen". During all tows deeper than 80 m, a 9 m long constraining rope was attached between the wires 120 m in front of the trawl doors. This kept a constant distance between the doors of about 50 m during the trawling. In shallow stations with depths of less than 80 m, the door-to-door distance varied more, depending on bottom type and currents. Data from the door and depth/trawl-height sensors were logged for all tows and are stored in files with CMG format, which makes it possible to study the trawl performance in more detail.

Trawl duration was standardized to 30 minutes. The trawling start time is controlled by using SCANMAR sensors to detect the landing of the trawl on the bottom, and the stop-time is defined as the time when the wires start to haul the net. In some cases the towing was interrupted before 30 minutes either due to poor bottom conditions or too high catches of fish indicated by the installed catch sensors. If the stations were not trusted to reflect the density of fish on the bottom they were recorded as invalid in the Nansis database. Table 2.1 shows the numbers of valid and invalid stations.

Catch Sampling

The trawl catches were sampled for species composition by weight and numbers. The deck sampling procedure is described in more detail by Strømme (1992). Length measurements (total length) were taken for target species. The length of each fish was recorded to the nearest 1 cm below. The mantle length was measured to the nearest 1 cm below for Sepia spp. In addition, at a few stations total length and body weight (g) were recorded. Basic information recorded at each fishing stations, i.e. trawl hauls, is presented in Annex I. Pooled length frequency distributions, raised to catch per hour, of selected species are shown in Annex II. The swept-area estimates are presented in Annex III. A description of the fishing gears used, acoustic instruments and their standard settings is given in Annex IV.

Samples for the marine biodiversity collection

An attempt was made to take a tissue sample of every species captured, and preserve at least one individual of each to serve as voucher specimens deposited in the research collections of the California Academy of Sciences. In a few instances, the specimens from which tissues were taken were too large to preserve, so a photograph was taken of the sampled specimen to serve as the voucher. In a few instances, specimens representing species that were hitherto not recorded from the islands were discarded by the sorting crew before they could be retrieved and preserved. Fortunately, such instances were few, and improved procedures that were implemented during the survey ensured that such things did not happen more often.

2.3 Biomass estimates

Biomass estimates based on swept-area method

In the bottom trawl survey, stock biomasses was estimated by the swept-area method with catch per haul as the index of abundance (see Strømme 1992). The general formula to estimate biomass B, using this method is:

$$B = \frac{A}{a} \cdot \frac{\overline{X}}{q}$$

A is the total area surveyed, a is the swept area of the net per haul, \overline{X} is the average catch per haul (the index of abundance) and q is the proportion of fish in the path of the net that are actually caught. The density of the resource is estimated as biomass per unit area. In a stratified survey of k non-overlapping strata, if the mean catch per haul in stratum *i* and its variance are denoted by \overline{X}_i and s_i^2 respectively, then an unbiased estimate of the population mean \overline{X} is the stratified mean \overline{X}_{st} , which is given by:

$$\overline{X}_{st} = \frac{1}{N} \sum_{i=1}^{k} N_i \overline{X_i} = \sum_{i=1}^{k} W_i \overline{X_i}$$

where $Wi = \frac{Ni}{N} = \frac{A_i}{A}$ is the relative size of the ith stratum (A_i is the area of the ith stratum and A is the total area surveyed). The variance of the stratified mean is given by

$$\operatorname{var}(\overline{X}_{st}) = \sum_{i=1}^{k} W_{i}^{2} \operatorname{var} \overline{X}_{i} = \sum_{i=1}^{k} W_{i}^{2} \frac{s_{i}^{2}}{n_{i}^{2}}$$

where n_i is number of hauls in the ith stratum and n is the total number of hauls in the survey.

Table 1.1 shows the areas used in the swept-area method to estimate biomass for the different regions. A stratified semi-random design was used with depth and region as stratification factors. Estimated total biomass by species/group was obtained by summing estimates for each depth stratum.

For conversion of catch rates (kg/hour) to fish densities (t/NM²), the effective fishing area was considered as the product of the wing spread and the haul length, or distance over the bottom, as measured by means of the SCANMAR[®] equipment based on GPS readings. The area swept for each haul was thus 18.5 times the distance trawled, raised to NM²/hour. The catchability coefficient (q), i.e the fraction of the fish encountered by the trawl that was actually caught, was conservatively (and for comparison with previous surveys) assumed equal to 1. Mean fish densities by species and strata and the total area surveyed were calculated by the swept-area module in Nansis Maptool.

CHAPTER 3 OCEANOGRAPHIC CONDITIONS

3.1 Surface distribution

The surface layer temperature (5 m depth) were continuously recorded during the cruise. Figure 3.1 shows the horizontal distribution of sea surface temperature (SST) for São Tomé and Principe

The SST around Principe was relatively high on the northern part of the island with temperatures above 29° C. The temperature decreased gradually to $<27^{\circ}$ C at the southern side of the island plateau. The temperature is slightly higher than what has been observed previous years but the survey is also 1-2 months earlier in the year than previous surveys and it is difficult to make any direct comparison.

The temperature at São Tomé varied from 28° C off the shelf at the north eastern side of the island to $<23^{\circ}$ C at the south eastern side over the shelf. The cooler temperature indicating upwelling within that area supported also by increasing salinity and relative fluorescence in the same area. The eastern side showed water temperatures around 26-27^{\circ}C. A temperature front was observed at the central west coast of the island with temperatures increasing rapidly northwards. There was generally more variability in temperature within the surveyed area than observed previous years.



Figure 3.1 Horizontal distribution of surface temperature (5 m depth) off São Tomé and Princípe

The Sea surface salinity SSS (Figure 3.2) was recorded from the Thermosalinograph at 5 m depth. SSS at Príncipe showed lowest salinity at the northern side of the island (<33.0). A frontal zone was observed south of the island where salinity increased from 33.2 close to the island towards 35.8 at the far south eastern end of the plateau.

Around São Tomé salinity around 35.5 was experienced over most of the eastern and south western side. Salinity above 36.0 was experienced in one area on the far south western side corresponding with cooler temperatures. A strong salinity front was observed at the north western side of the island with salinity decreasing from 35.5 towards 33.5. There were generally more variability in salinity within the investigated area than what has been observed

previous years with both higher minimum and maximum values compared with previous surveys.

The temperature and salinity map indicates two water masses of different origin. Cooler more saline water masses approaching from the south east of São Tomé and warmer water masses corresponding with low salinity waters with the origin in the Gulf of Guinea.



Figure 3.2 Horizontal distribution of surface salinity (5 m depth) in São Tomé and Príncipe

Relative fluorescence was also recorded from the thermosalinograph. Fluorescence is a proxy for chlorophyll in the water and indicate were the production is highest. The surface values observed off Príncipe were low (around 0.01) and gave no indications of upwelling or high production on the shelf. This was also the case around São Tomé with only slightly increasing

chlorophyll values >0.02 at the south western side of the island associated with cooler and more saline water masses indicating upwelling in this area.

3.2 Vertical sections

Three CTD transects with recorded temperature, salinity, dissolved oxygen and fluorescence were sampled on Príncipe, Figure 3.3. Figure 1.1 show the position of the various CTD transects. Temperature profiles showed stable surface temperature around 28°C in the upper 25 m with a thermocline on the shelf to 50 m depth with temperatures < 22°C below, decreasing to 8°C at 500 m depth. The profiles showed signs of downwelling off the shelf. Salinity profiles showed lowest surface salinity close to the coast (34.0), except for the north eastern transect where the lowest salinity was found offshore (33.5). A salinocline was present at around 25 m depth with salinity increasing from 34.0 to a salinity maximum of 36.0 at on the shelf edge around 80 m depth. The salinity then declined to <35.0 from 300 m depth and deeper. The oxygen profiles showed well oxygenated water with surface values above 4.5 ml/l gradually declining to < 2ml/l at 500 m depth. Relative fluorecence was also recorded from the CTD. It show that the highest production occurred just below the termocline from about 50 m depth. Highest production was just off the shelf edge with relative values >0.3.

Four CTD transects were taken off São Tomé, three of them are depicted in Figure 3.3. Figure 1.1 show the position of the transects. The São Tomé west transect was taken on the southern side of the frontal zone and show surface temperatures around 23-24°C, gradually decreasing to 18°C at 100 m depth and temperatures of 8°C at 500 m depth. The two other transects in the south and north east of São Tomé show surface temperatures above 25°C and a stronger temperature decrease in the upper 50 m. The salinity show surface values >36.0 close to the coast on the west and south transect and 35.5 at the north eastern transect. In deeper waters the salinity decreased gradually towards 35.0 deeper than 300 m. The oxygen values show well oxygenated waters trough the whole water column on all transects with surface values of 4.5 ml/l decreasing to 1.5 ml/l between 250-300 m depth and increasing again in deeper waters. The relative fluorescence show highest primary production in water depths 50-100 m depth on the west and south of the island. The north western transect also shows somewhat higher primary production towards the surface inshore on this transect. Primary production on the two other transects.

Comparing the transects off São Tomé and Príncipe one can observe the effect of the warmer and less saline surface waters coming from the Gulf of Guinea having a pronounced effect in the upper 50 m of the water column at the northern most island.



São Tomé - west

673 0.3∰ 673 667 673 667 673 667 667 -36.0J .0.^ 22 4.0 20 0.2 18 -100-0.1 16 (m) -200-th -300-3.0 35.5 14 -2.0 1.5 12 35.0 10 1.5 -400 2(01/1) 8 Ċ Flu(Rel) П Salinity







Figure 3.3Vertical sections of temperature, salinity and oxygen and relative fluorescence at São Tomé
and Príncipe; Príncipe - southeast, Príncipe - northeast, Príncipe - west, São Tomé - west, São
Tomé - south, and São Tomé - northeast.

CHAPTER 4 RESULTS

4.1 Acoustic observations around São Tomé and Príncipe

The distribution area of main groups of pelagic fish in the region, i.e. sardinellas, PEL 1 (Clupeids), PEL 2 (mainly carangids) and horse mackerel, are recorded with the Simrad ER 60 echosounder. However as during previous years only very few registrations were made of small pelagic species off São Tomé and Príncipe. Some *Sardinella maderensis* and *Sardinella aurita* was caught off São Tomé. However, no estimate of abundance was made for these areas. Pelagic fish, mainly flying fish *Parexocetus brachytpterus*, were observed on the surface both during the night and day, but these were not recorded on the echo sounder. There were consistent acoustic recordings of demersal fish over the whole shelf area on both islands, and particularly on the shelf edge and other untrawlable grounds. This indicates that the trawl survey underestimates the abundance of demersal fish on the islands.

4.2 Fish traps

During this survey a few fishing trials was conducted with Norwegian made fish traps (baited and unbaited). The first type was a two chamber foldable cod trap and a double round trap with leading net for lobster. The first setting of 7 traps was made on the eastern side of Príncipe. However all traps were stolen by local fishermen during the night and no results were obtained. The next set of five traps were deployed on the south eastern side of São Tomé on shallow sandy bottom. Soaking time was about 24 h. One *Sepia officinalis* was caught in total. Most of the bait was removed from the traps indicating that small fish had been eating on the bait without been caught. The third set of traps (five in total) was set on the south western side of São Tomé. Soaking time was 24 h. One trap was lost in the strong wave surge, the four others gave no results but all bait was removed. The bait was replaced and the traps reset for another 24 h. this time two more traps was lost in the heavy sea while one trap came up empty and one trap caught one royal spiny lobster (*Panulirius regius*). After this the trap trials was discontinued. The traps seems to be relatively unstable in the heavy surge around São Tomé. They were often moved from their location of deployment and did not seem to be efficient in this environment.

4.3 **Results from the trawl survey**

The composition of the fish fauna on the continental shelf and slope changes with depth and the catch-distribution analyses were therefore performed for three depth strata on the shelf, 0-50 m (inner shelf) and 51-100 m (outer shelf). The analyses where performed on the following groups; Demersal, pelagic, shrimps, cephalopods, sharks and others. The Demersal group consist of the valuable demersal species groups, Grunts, Groupers, Croakers, Snappers

and Seabreams. For the different analysis the "other" group includes all species not accounted for in any group elsevere. Therefore, the content of "other" will change from table to table.

The locations of the trawl stations are shown in Figure 1.1. Records of fishing stations and catches are presented in Annex I and pooled length distributions (weighted by catch) of main species by area are shown in Annex II. In the swept-area biomass estimates, only the shelf area down to depths of 100 m was included. Mean densities of the main demersal species by depth strata, occurrence and catch distributions are shown in Annex IV.

Príncipe

A total of 13 swept area trawl stations was carried out on Príncipe, four in depths <50 m and nine between 51 -100 m. The shelf generally is very steep and no trawl stations were possible deeper than this.

The overall catch rate on the inner shelf was 352 kg/h (Table 4.1 a). The most abundant species where found within the group of "other" species. It was particularly the flying gurnard, *Dactylopterus volitans*, that was abundant in the catches, contributing 36% to the overall catch (128 kg/h). Also the small cowfish, *Acanthostracion guinensis*, was very abundant in the catches with 35% and 123 kg/h of the overall catch. Other species were only present in low numbers. Pelagic species, mainly carangids had catch rates of 10.9 kg/h or 3.1% of the overall catch while demersal species, mainly various types of Seabreams had average catch rates of 9.4 kg/h (2.7% of the catch). Cephalopods had catch rates of 5 kg/h while no shrimps or sharks were found.

Deeper than 50 m catch rates decreased considerably to 127 kg/h (Table 4.1 b). The group of "other" species was still the most abundant with *Dactylopterus volitans* as the most abundant species with catches of 50 kg/h and 39% of the overall catch. The group of other species contributed with 46% of the catch and catch rates of 58 kg/h. The catch consisted mainly of seabreams, the red pandora, *Pagellus bellottii*, and bluespotted seabream, *Pagrus caeruleostictus*. Cephalopods comprised 4 % of the catch and 1.4 kg/h. no shrimps or sharks were found.

Principe. Catch rates (kg/h) of main demersal species grouped by families in swept-area bottom-trawl hauls on the shelf a) 0-50 m, b) 50-100 m

a) 0-50 m

Station	Gear	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
	depth							
3	49.5	8.2	17.8	2.3	0	0	291	319.4
4	31	10.4	2.9	25.9	0	0	586.5	625.6
5	39	1.4	14.1	2.4	0	0	79.9	97.8
12	42.5	0	2.9	12.8	0	0	350.3	366
Mean	40.5	5	9.4	10.9	0	0	326.9	352.2
Std dev	7.7	5.1	7.7	11.2	0	0	208.4	216.6
%		1.4	2.7	3.1	0.0	0.0	92.8	100.0

b) 51-100 m

Station	Gear	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
	depth							
1	59.5	16.9	15.6	6	0	0	3.7	42.1
2	52.5	0.1	7.7	0.5	0	0	4.6	13.1
6	60	6.9	127.1	4.2	0	0	92.7	230.9
7	66	1.5	75.5	0	0	0	30.1	107.2
8	80.5	2.6	193.2	0	0	0	20.7	216.5
9	89.5	2.4	18.9	1.3	0	0	18.8	41.4
10	73.5	5.8	35.1	0.5	0	0	58.5	99.9
13	86	7.2	36.8	0	0	0	14.2	58.2
14	64	2.8	13.1	0	0	0	315.9	331.8
Mean	70.2	5.1	58.1	1.4	0	0	62.1	126.8
Std dev	12.9	5.0	63.5	2.2	0.0	0.0	99.4	108.5
%		4.0	45.8	1.1	0.0	0.0	49.0	100.0

São Tomé

A total of eight swept area trawl stations was carried out off São Tomé, two in depths <50 m and six between 51 -100 m (Table 4.2). The shelf is generally very steep around the island and no trawl stations were possible deeper than this. Since only two trawls were possible more shallow than 50 m the catch rates was summarized for the whole region from 0-100 m as one.

The overall catch rate was 462 kg/h. The most abundant species where within the group of "other" which contributed to 48% of the overall catch. It was particularly the flying gurnard, *Dactylopterus volitans*, that was abundant in the catches contributing 27% to the overall catch (126 kg/h) and lesser African threadfin, *Galeoides decadactylus*, who contributed 25 kg/h or 5% of the total. The second most important group was the valuable demersal species that contributed with average catch rates of 199 kg/h or 43% of the overall. The most common species in this group was the golden snapper, *Lutjanus fulgens*, with average catches of 93 kg/h or 20% of the total, and the red pandora *Pagellus bellottii* who contributed 53 kg/h or 11% of the total. Pelagic species, mainly carangids contributed with catch rates of 31 kg/h or

7% of the total while Cephalopods had catch rates of 11 kg/h, \sim 2% of the total. Sharks and shrimps were not important in the catches.

Station	Coor	Cambalamada	Domorrol	Dalagia	Shortra	Chainana	Other	Total
Station	depth	Cephalopous	Demersar	Pelagic	Sharks	Similips	Other	Total
18	73	0.8	143.6	2.6	0	0	46.9	194
19	44.5	6.5	48.7	1.4	0	0	193.5	250.1
20	69	18.2	49.1	115.7	0	0	212.4	395.4
21	25	6.5	6.3	78.9	0	0	480.2	571.9
22	68.5	1.3	46.3	10.5	0	0	57.5	115.5
25	61	12.9	311.9	5.1	0	0.1	101.8	431.8
26	57.5	18.4	870.4	21.7	0	0	394.2	1304.8
27	67	21.5	117	9.1	0	0	284.4	431.9
Mean	58.2	10.7	199.2	30.6	0	0	221.4	461.9
Std dev	16.1	8.1	287.6	42.8	0	0.1	157.3	371.4
% Catch		2.3	43.1	6.6	0.0	0.0	47.9	100.0

Table 4.2São Tomé. Catch rates (kg/h) of main demersal species grouped by families in swept-area
bottom-trawl hauls on the shelf a) 0-50 m, b) 50-100 m

4.4 **Biodiversity**

Of the 41 trawl stations occupied during the survey, 35 were with a bottom trawl and six with a pelagic trawl. Shelf depths fished with the bottom trawl varied from 26 to 94 m, while those with the pelagic trawl were over the continental slope over bottom depths varying from around 300 m to almost 1100 m. The pelagic trawl was rigged with buoys attached to the headrope, so as to fish from the surface to no deeper than about 10 m below the surface; it was deployed only during the night and captured mostly vertically-migrating species.

Table 4.3 lists the 514 specimens of fishes representing more than 145 species that were collected off São Tomé and Príncipe during the survey. These specimens will be deposited in the California Academy of Sciences research collection of fishes. The list is not all-inclusive in that some species captured in the trawls were not saved for one reason or another. Proper identifications of many specimens still await further examination and a thorough check of the literature; these unidentified specimens may add to the total number of species represented. This holds particularly true for the near-surface collections made at night with the pelagic trawl: mid-water and juvenile fishes, which are often difficult to identify, dominated these catches. Of the 145+ species collected, more than 50 represent species that have not been recorded previously from São Tomé and Príncipe (these species are noted with an asterisk following their names); a few may represent undescribed species. Table 4.4 lists the 118 species of fishes (and one invertebrate) from which tissue samples were taken for DNA analysis; most of these samples will be deposited in the University of Kansas tissue collection, but others will be sent to specialists on their request. The tag numbers in the table refer to the

numbered vials in which tissue from the specimens are stored (in 95% ethyl alcohol). The number is also written on the tie tags attached to the particular specimen. Although a comprehensive collection of invertebrates would have been desirable, the interests of the collector and the constraints imposed on bulk and weight by carrying the specimens as airline luggage precluded such collections. Thus, only 31 specimens representing 21 invertebrate species and one alga were retained for deposit at the California Academy of Sciences.

_	Family	Species name	Sta. No.	#saved
1	Acanthuridae	Acanthurus monroviae	15,26,28	2
2	Acropomatidae	Synagrops bellus*	33,34,35	4
3	Albulidae	Albula vulpes	12	1
4	Anguilliformes	leptocephalus	15,16	41
5	Antennariidae	Antennarius pardalis	25	1
6	Antennariidae	Antennarius sp	32	1
/	Anthiidae	Anthias anthias	6	1
8	Apogonidae	Apogon canariensis*	34,35	4
9	Apogonidae	Apogon sp. A*	11,15,18,32	18
10	Apogonidae	Apogon sp. B*	33 9 12	0
12	Artonathidae	Anomma bonai ·	0,13	2
12	Aulostomidae	Aulostomus strigulus	2	2
14	Balistidae	Ralistes capriscus	23	1
15	Balistidae	Balistes punctatus	3	1
16	Bothidae	Arnoglossus imperialis*	20	4
17	Bothidae	bothid larvae	11.15	34
18	Bothidae	Bothus guibei	5,12	2
19	Bothidae	Bothus podas*	21,33	2
20	Bothidae	Citula ligulatula	20	1
21	Bramidae	Taractes	17	1
22	Bregmacerotidae	Bregmaceros sp	23	2
23	Carangidae	Carangoides bartholomaei	12	2
24	Carangidae	Caranx crysos	12	1
25	Carangidae	Decapterus macarellus	4	1
26	Carangidae	Decapterus punctatus	2,19	2
27	Carangidae	Selar crumenophthalmus	4	1
28	Carangidae	Selene dorsalis	22,28	8
30	Carangidae	Seriola carpenteri	3,18	2
32	Carangidae	Seriola rivoliana	6	1
33 24	Carangidae	Uraspis secunda	30	1
34	Canapidae	Canala sp	30.33	1
36	Ceratiidae	Cryptosaras couasi*	17	1
37	Chaetodontidae	Chaetodon hoefleri	26	1
38	Chaetodontidae	Prognathodes marcellae	18	1
39	Clupeidae	Sardinella aurita	25	1
40	Clupeidae	Sardinella maderensis	16	1
41	Congridae	Ariosoma sp*	27	1
42	Congridae	Conger eel*	30	2
43	Congridae	Uroconger?*	32,35	3
44	Dactylopteridae	Dactylopterus volitans	3,5,34	1
45	Diodontidae	Chilomycterus spinosus mauretanicus*	2	1
46	Diodontidae	Diodon holocanthus	1	1
47	Drepanidae	Drepane africana	12	1
48	Ephippidae	Ephippus goreensis	37	1
49	Exocoetidae	Cypselurus cyanopterus*	15	1
50	Exocoetidae	Hirundichthys affinis*	11	1
51	Fistulariidae	Fistularia petimba*	11 15 17 24	4
52 52	Gempylidae	Neolotes tripes: ** Nociarchus pasutus*	11,15,17,24	0
54	Gempylidae	Notoscopalus sp*	24	1
55	Gempylidae	Promethichthys prometheus*	24	1
56	Gempylidae	short hody*	17	1
57	Gobiidae	goby unident w/fine blk vertical lines*	33	1
58	Gobiidae	Leseurogobius?*	22.25.30.32.40	9
59	Gobiidae	Thorogobius angolensis?*	30.34.35.40	10
60	Gonostomatidae	gonostomatid larva?*	16	5
61	Gonostomatidae	Howella sp*	17	1
62	Haemulidae	Pomadasys incisus	23	1
63	Haemulidae	Pomadasys rogeri	23	1
64	Hemiramphidae	Hemiramphid larvae	15	2
65	Holocentridae	Holocentrid larvae	15	1
66	Labridae	Bodianus speciosus	7	1
67	Labridae	Labrid larva?	16	1
68	Labridae	Xyrichtys novacua	21	1
69	Lethrindae	Lethrinus atlanticus	2	1
70	Lophotidae	Eumecicthys fiski*	17	1
/1	Lutjanidae	Apsilus Juscus Lutianus fulgora	25,26,28,32	5
72	Lutjanidae	Luijanus juigens Lutianus goreensis	0	1
73	Malacosteidae	Luijunus goreensis Malacosteus sp*	12	1
/ +	manacostenae	manacosiens sp	17	2

Table 4.3 lists of the specimens of fishes that were collected off São Tomé and Príncipe during the survey.

138 139 140 141 142 143	Trachinidae Trachinidae Triglidae Triglidae Triglidae	Trachinus armatus Trachinus radiatus Cheilodonichthys gabonensis* Cheilodonichthys lastoviza* Lepidotrigla carolae*	6,9 19 10 7,33,34,35	1 2 1 3 4
138 139 140 141 142	Trachinidae Trachinidae Triglidae Triglidae	Trachinus armatus Trachinus radiatus Cheilodonichthys gabonensis* Cheilodonichthys lastoviza*	6,9 19 10	1 2 1 3
138 139 140 141	Trachinidae Trachinidae Triglidae	Trachinus armatus Trachinus radiatus Cheilodonichthys gabonensis*	6,9 19	1 2 1
138 139 140	Trachinidae Trachinidae	Trachinus armatus Trachinus radiatus	6,9	2
138 139	Trachinidae	Trachinus armatus		1
138				1
1	Torpedinidae	Torpedo torpedo(spp.?)	4,6,7,8,32	7
130	Tetraodontidae	Tetraodontid larva	28	1
135	Tetraodontidae	Lagocephalus lagocephalus Sphoeroides pachyaaster*	0	4
134	Tetraodontidae	Lagocephalus laevigatus	22	1
133	Tetraodontidae	Canthigaster rostrata*	26	1
132	Synodontidae	Trachinocephalus myops	10	1
131	Synodontidae	synodontid larva	11,16	38
130	Synodontidae	Saurida brasiliensis*	17,30	4
120	Stomiidae	Stomias?*	17	3
127	Spnyraenidae Stomiidae	spnyraena sphyraena* Eustomias?*	33	1
126	Sphyraenidae	Sphyraena guachancho	4	1
125	Sparidae	Pagrus caeruleostictus	1,19,25,26	4
124	Sparidae	Pagellus bellottii	1	1
123	Sparidae	Dentex congoensis	1	1
122	Sparidae	Dentex canariensis*		1
121	Sparidae	Brachydeuterus auritus	19	1
120	Sparidae	Boops boops	32	$\frac{1}{2}$
110	Soleidae	Microchirus Jreenkopi · Microchirus hexophthalmus*	20,30	$\frac{2}{2}$
11/	Soleidae	Dicologogiossus sp Microchirus frechkopi*	23 26 30	1
116	Serranidae	Serranus n.sp. Heemstra	21,30,32	3
115	Serranidae	Serranus accraensis*	26	1
114	Serranidae	Rypticus saponaceus	1	1
113	Serranidae	Paranthias furcifer	6,18	2
112	Serranidae	Epinephelus aeneus	25	1
111	Serranidae	Epinephelus goreensis	22	0
110	Scorpaenidae	hanica*	22	1
109	Scorpaenidae	Scorpaena laevis Scorpaena São Tomá and Príncinc	21,30	2
108	Scombridae	Scombrid larvae	15	8
107	Scombridae	Euthynnus alletterratus	16	1
106	Sciaenidae	Umbrina canariensis*		1
105	Sciaenidae	Pseudotolithus senegalensis	30	1
104	Rajidae	Raja miraletus*	10	1
103	Psettodidae	Psettodes belcheri*	3	1
102	Priacanthidae	Priacanthus arenatus	10,30,32	4
100	Polynemidae	Galeoides decadactylus	22	1
99 100	Paranenuryidae	Syacium guineensis Grammoplites gruveli*	1,19	2
98	Paralichthyidae	Citharus linguatula*	7 10	1
97	Paralepididae	Lestidiops?*	34	2
96	Ostraciidae	Acanthostracion guineensis	3	1
95	Ophidiidae	Ophidion lozanoi?*	33	7
94	Ophidiidae	Brotula barbata*		1
93	Ophichthidae	Ophicthis ophis	33	1
92	Ophichthidae	Echelus myrus*	23	1
91	Notoscopelidae	Notoscopelus sp*	17	1
90	Nomeidae	Cubiceps paucinaaans Cubiceps sp A*	17 32 33 34 35	13
00 89	Nomeidae	Neuasoma sp?** Cubicens pauciradiatus*	52 11 15 17	6
8/	Nemicninyidae	Nemichthys curvirostris* Nattasoma sp2*	17	1
86	Myctophidae	Myctophids*	24,32,33	27
85	Myctophidae	myctophid small*	15,17	43
84	Myctophidae	myctophid silvery*	15	17
83	Myctophidae	myctophid denuded large*	15,17	12
82	Muraenidae	Muraena melanotis	26	1
81	Mullidae	Pseudupeneus prayensis	5,16	2
80	Moridae	Physicalus sp A*	32.33.34.35	11
/8 70	Moridae	Outeria interolis" Physicalus cyanostrophys*	23 23 24	1 4
77	Monacanthidae	hispidus	4	1
		São Tomé and Príncipe hanolepis		
76	Monacanthidae	Alutera monoceros*	30	1
	Monacanthidae	Alutera heudeloti(?)*	5	1

Tissue samples only Family	São Tomé et Príncipe – DFN Survey 2010-04-05 Species name	Station	Tissue #saved	Tissue vial #
Serranidae	Rypticus saponaceus	1	1	1
Diodontidae	Diodon holocanthus	1	1	2
Sparidae	Dentex congoensis	1	1	3
Aulostomidae	Aulostomus strigulus	2	1	4
Sparidae	Pagellus bellottii	1	1	5
Sparidae	Pagrus caeruleostictus	1	1	6
Diodontidae	Chilomycterus spinosus	2	1	7
Carangidae	Decapterus punctatus	2	1	8
Dactylopteridae	Dactylopterus volitans	3	1	9
Lethrindae	Lethrinus atlanticus	2	1	10
Balistidae	Balistes punctatus	3	1	11
Balistidae	Balistes capriscus	3	1	12
Ustraciidae	Acanthostracion quadricornis	3	1	13
Coronaidae	Psettodes beicheri	3	1	14
Larangidae Formodinidoo	Termodo termodo(2)	3	1	15
Sphyraopidae	Sphuraena sphuraena	4	1	10
Parangidae	Decenterus mecarellus	4	1	17
Jarangidae	Selar crumonophthalmus	4	1	10
Monacanthidae	San Tomé and Príncine hanolenis hispidus	4	1	20
Dactylopteridae	Dactylonterus volitans	-+	1	20
Bothidae	Bothus guihei	5	1	21
Mullidae	Pseuduneneus pravensis	5	1	22
Monacanthidae	Alutera heudeloti	5	1	23
utianidae	Lutianus fulgens	6	1	25
Serranidae	Paranthias furcifer	6	1	26
Frachinidae	Trachinus radiatus	6	1	27
Anthiidae	Anthias anthias	6	1	28
Carangidae	Seriola rivoliana	6	1	29
Forpedinidae	Torpedo torpedo(?)	6	1	30
Labridae	Bodianus speciosus	7	1	31
Forpedinidae	Torpedo torpedo(?)	7	1	35
Friglidae	Lepidotrigla carolae	7	1	33
Paralichthyidae	Syacium micrurum	7	1	34
Forpedinidae	Torpedo torpedo(?)	7	1	32
Ariommidae	Ariomma bondi	8	1	36
frachinidae	Trachinus radiatus	9	1	37
Zeidae	Zeus faber	9	1	38
Fetraodontidae	Sphoeroides pachygaster	9	1	39
Forpedinidae	Torpedo torpedo(?)	9	1	40
Priacanthidae	Priacanthus arenatus	10	1	41
Friglidae	Cheilodonichthys lastoviza	10	1	42
Synodontidae	Trachinocephalus myops	10	1	43
Rajidae	Raja miraletus	10	1	44
Jranoscopidae	Uranoscopus polli	10	1	45
Synodontidae	synodontid larva	11	1	46
Synodontidae	synodontid larva	11	1	47
Nomeidae	Cubiceps pauciradiatus	11	2	48,51
Gempylidae	Nolotes tripes	11	2	49,52
Exocoetidae	Hirundichthys affinis	11	1	50
Drepanidae	Drepane africana	12	1	53
Botnidae	Bothus guibei	12	1	54
arangidae	Caranx crysos	12	1	33
	Lutjanus goreensis	12	1	30 57
Corongideo	Albula vulpes Caranacidos hartholomaci	12	1	59
Caranidaa	Caranyo agus	12	1	50
Exocoetidae	Curapus acus	15	1	61
Myctophidae	cypseratus cyanopieras muctonhid silvery	15	1	62 62
Myctophidae	myctophia suvery myctophia danudad larga	15	∠ 2	64 65
Myctophidae	mycrophia aenuaea iarge mycrophid small	15	2	66 67
Mullidae	mycropnia snau Mullid juvenile	15	ے 1	00,07 60
Scombridge	munu juvenne Futhymnus allattarratus	10	1	08
Clupeidee	Sardinolla madoronsis	10 1 <i>4</i>	1	70 71
Tarangidae	Seriola carpenteri	10	∠ 1	70,71
Serranidae	Paranthias furcifer	10	1	72
Chaetodontidae	Chaetodon marcellae	10	1	73 74
inactouonnuae	Chacibaon martenae	10	1	74

Table 4.4 lists of the species of fishes (and one invertebrate) from which tissue samples were taken for DNA analysis

Platycephalidae	Grammoplites gruveli	19	1	75
Triglidae	Cheilodonichthys gabonensis	19	1	76
Sparidae	Brachydeuterus auritus	19	1	77
Bothidae	Arnoglossus imperialis	20	2	78,80
Bothidae	Citula ligulatula	20	1	79
Myctophidae	myctophid denuded large	17	1	81
Gempylidae	short body	17	1	82
Myctophidae	myctophid small	17	1	83
Nomeidae	Cubiceps sp A	17	1	84
Notoscopelidae	Notoscopelus sp	17	1	85
Gonostomatidae	Howella sp	17	1	86
Bramidae	Taractes	17	1	87
Astronesthidae	genus	17	1	88
Malacosteidae	Malacosteus sp	17	1	89
Serranidae	Serranus n.sp. Heemstra	21	1	90
Labridae	Xyrichtys novacua	21	1	91
Bothidae	Bothus podas	21	1	92
Scorpaenidae	Scorpaena laevis	21	1	93
Polynemidae	Galeoides decadactylus	22	1	94
Gobiidae	Gobiid	22	1	95
Carangidae	Selene dorsalis	22	1	96
Tetraodontidae	Lagocephalus laevigatus	22	1	97
Haemulidae	Pomadasys rogeri	23	1	98
Haemulidae	Pomadasys incisus	23	1	99
Serranidae	Epinephelus goreensis	23	1	100
Bregmacerotidae	Bregmaceros sp	23		101
Synodontidae	Saurida brasiliensis	17	1	102
Ophichthidae	Echelus myrus	23	1	103
Soleidae	Dicologoglossus sp	23	1	104
Gempylidae	Notoscopelus sp	24	1	105
Gempylidae	Neolotes tripes?	24	1	106
Lophotidae	Eumecicthys fiski	17	1	107
Sparidae	Pagrus caeruleostictus	25	1	108
Antennariidae	Antennarius pardalis	25	1	109
Clupeidae	Sardinella aurita	25	1	110
Gobiidae	Leseurogobius	25	1	111
Serranidae	Epinephelus aeneus	25	1	112
Serranidae	Serranus accraensis	26	1	113
Tetraodontidae	Canthigaster rostrata	26	1	114
Chaetodontidae	Chaetodon hoefleri	26	1	115
Soleidae	Microchirus frechkopi	26	1	116
Muraenidae	Muraena melanotis	26	1	117
Lutjanidae	Apsilus fuscus	26	1	118
Acanthuridae	Acanthurus monroviae	26	1	119
Congridae	Ariosoma sp	27	1	120
Sciaenidae	Pseudotolithus senegalensis	30	1	121
Cepolidae	Cepola sp	30	1	122
Monacanthidae	Alutera monoceros	30	1	123
Gobiidae	Thorogobius?	30	2	124,125
Congridae	Conger eel	30	1	126
Sparidae	Boops boops	32	1	127
Nomeidae	Cubiceps sp A	32	1	128
Apogonidae	Apogon sp. A	32	1	129
Moridae	Physiculus sp A	32		130
Tetraodontidae	Lagocephalus juv.	32		131
Antennariidae	Antennarius sp	32		132
Carangidae	Uraspis secunda	36		133
Ephippidae	Chaetodipterus goreensis	37		134
Moridae	Physiculus sp A	33		135
Apogonidae	Apogon sp. B	33		136
Soleidae	Microchirus hexophthalmus	33		137
Ophidiidae	Ophidion lozanoi?	33		138
Moridae	Gadella imberbis	33		139
Acropomatidae	Hypoclydonia bella	33		140
Nomeidae	Cubiceps sp A	33		141
Ophichthidae	Ophicthis ophis	33		142
Stomiidae	Eustomias?	33		143
Opisthobranchia	Nudibranch	2	1	

Although the list of species collected by *Dr. Fridtjof Nansen* is extensive, many species that are more commonly found closer inshore or in cryptic habitats that the vessel was unable to

sample were not obtained. The bottom topography also precluded sampling in many areas that may be found eventually to harbor a rich ichthyofauna. Almost certainly, sampling of the rugged slope areas around the islands would have added many more species to the total, but other methods must be used to properly sample those areas. Comparisons of the catches made during the previous four surveys with those of the current survey also revealed a substantial number of species that were not collected this year. This may reflect a random distribution of species in space and time, rare species (and therefore few individuals available to the trawl), or simply misidentifications. It is obvious from these collections that much of the marine fauna of the islands has yet to be discovered and documented. This is particularly the case with species that live in habitats that have not been adequately surveyed and for those smaller, cryptic species that are difficult to collect by usual fishery methods. In that regard, the collections and observations by scuba divers suggest the possible presence of many yet-to-bediscovered species.

The collection of voucher specimens from which identifications can be checked subsequent to the surveys would have been immensely useful, but such collections were not made until the current survey. Photographs of specimens with accompanying identifications applied during each survey would also be of considerable help in verifying the identifications made and in part substitute for the collection of voucher specimens. In a few instances, such photographic documentation was done by one of us (O. Alvheim) on previous surveys. Re-identifications by photographs and specimens would allow retroactive corrections of identifications from past surveys and permit more accurate and cogent comparisons of year-by-year catches.

As a comparison to the present findings Pedro Afonso et al. in 1999 (Arquipélago Life and Marine Sciences 17A:65-92) recorded a total of 124 species of fishes in 108 genera and 61 families from São Tomé and Príncipe. In a more-recent publication by Peter Wirtz et al. (2007; Zootaxa 1523:1-48) an updated list of the coastal fishes included 234 fish species, of which 59 constituted new records and 10 species new to science; the authors also listed nine species as endemic to the islands. Considering the vagility of marine fishes, particularly in their early life stages when they are part of the zooplankton fauna and subjected to oceanic currents, the relatively low endemism is perhaps not surprising. The origins of the fish fauna are various, and the relative proximity to the African continent undoubtedly played a dominant role in the development of the marine fauna of São Tomé and Príncipe. However, Wirtz (2001, 2003, 2004) has cited the presence of amphi-Atlantic species of marine invertebrates and fishes as compelling evidence of New World sources for at least part of the fauna. Prevailing surface currents in the region lend support for this argument, although it is known that the islands of São Tomé and Príncipe are sometimes each under very different hydrographic regimes, as observed during this year's survey. Currents can vary considerably and display complex patterns, as the large equatorial currents strike the continent along the Gulf of Guinea and intermix with other currents, including the subequatorial counter-current, and water masses developed to the north and south of the equator. Seasonal shifts of water from the south displacing the water masses originating in the north are a normal condition.

4.5 Review of results

São Tomé and Príncipe are volcanic islands approximately 200 km from the coast of the mainland of Africa, and as such are characterised by an oceanic environment with higher salinity and lower temperatures than along the mainland of Gulf of Guinea. Also the bottom topography and substrate differs greatly from that on the mainland. The coast is rocky and very steep, with a shelf break on both islands around 80 - 100 m depth and bottom depths typically >1000 m off the shelf. The shelf is relatively flat and hard with patches of corral and stones and with sandy substrate in between. Demersal species dominates around the islands, but also pelagic species, carangids, and some few sardinella are found. The biomass estimate for São Tomé and Príncipe was only calculated for the area between 0 - 100 m depth, because trawling was not possible off the shelf break, additionally, due to the nature of the topography on the islands the trawl survey did not cover a fully representative part of the shelf. The biomass estimates presented here must therefore be looked upon as indexes only and not a trough reflection of the actual biomass or a reflection of the total biodiversity. However, the trend in biomass may still be reliable. The biomass estimates are presented in Table 4.3 for selected species groups only. Generally, the biomass estimated on these islands may seem low due to the small shelf area investigated. If one rather looks at catch rates of demersal species like seabreams, gurnards and snappers one observe that these are relatively higher reflecting a relatively high abundance of these species. The fish resources on the island support an important artisanal fishery employing 20% of the nations workforce, and large changes in fish biomass will have huge consequences on the islands.

The abundance of selected species groups on São Tomé was the highest recorded during the surveys with Dr. Fridtjof Nansen since 2004. The overall biomass for these groups were about 1 000 tonnes. The abundance has been relatively stable around 800 tonnes during the previous surveys. Looking at Príncipe the abundance was the lowest during the whole time series with 500 tonnes. In 2007 the biomass was estimated at 2 000 tonnes while in 2006 1000 tonnes was estimated within this area.

The species composition on Principe consisted mainly of gurnards, the species *Dactylopterus volitans* and Seabreams. No biomass estimate was calculated for *Dactylopterus volitans* but the group had this year the highest catch rate observed trough the time series with 74 kg/h compared with 34 kg/h on average for the previous years. The biomass for seabreams was 350 tonnes this year compared with 1100 tonnes in 2007 and 800 tonnes, 1200 tonnes and 1100 tonnes respectively in 2006, 2005 and 2004. Groupers and snappers had catch rates of 40 tonnes each while Carangids was estimated to have an abundance of 30 tonnes and Cephalopods an abundance of 51 tonnes. Rays had an estimated abundance of 5 tonnes while Barracudas was estimated to 3 tonnes. Other species groups were not abundant on the shelf of Príncipe. The lower than previous abundance in Príncipe is mainly due to the low occurrence of seabreams during this survey and may be a reflection of the prevailing environmental

conditions with strong influence of water masses from Gulf of Guinea with low salinity and high temperature. This may have affected the seabreams and moved them to deeper waters making them inaccessible for trawling.

Dactylopterus volitans was the most abundant species in catches also in São Tomé with catch rates of 126 kg/h (Table 4.2). The most important commercial group in São Tomé were this year snappers (mainly *Lutjanus fulgens*). The biomass of snappers was estimated to 410 tonnes, compared with 160 tonnes in 2007 and 200 tonnes in 2006, In 2005 only one catch of snappers were made but the catch was so big that it was decided to exclude it form the overall biomass calculation because it was not considered representative for the overall abundance. In 2004 150 tonnes of snappers was estimated. The second most important group during the survey this year was the seabreams. 290 tonnes was estimated. However, as in Príncipe this was a decrease from previous years results where the catch rates have been around 450 tonnes. The biomass estimate for grunts was 74 tonnes, an increase from previous years while groupers had an estimate biomass of 44 tonnes. The biomass of carangids, cephalopods, and barracudas were estimated at 91 tonnes, 45 tonnes and 33 tonnes respectively. Other species were of less importance.

The marine fishes of the islands of São Tomé and Príncipe have been little studied over the course of the islands' history dating to the late 1400s, when the islands were first settled by Europeans. During the colonial period, there appeared to have been little interest in the marine resources of the islands, and only a sprinkling of publications, primarily by Balthazar Osorio of the Museu Bocage in Lisbon in the late 1800s, documented the fish fauna. Following independence from Portugal in 1975, the Democratic Republic of São Tomé et Príncipe was formed as one of the smallest and poorest nations in the world. The entire population in 2003 was estimated (by FAO) to be around 160,000, with an economy that relied heavily on agriculture, primarily cacao. An artisanal fishery apparently flourished after independence, as such activities provided an easy means by which a person could gain some income and provide family with an important food source. Such artisanal fisheries currently account for an estimated 60-70% of the protein consumed by the population. Currently, offshore fishery resources of São Tomé and Príncipe are exploited by foreign vessels licensed by the government; these licenses provide important foreign currency needed to purchase imported manufactured products, almost none of which is produced on the islands. (Foreign aid is the most important resource by which the government is able to operate, and the infrastructure maintained and improved.) The lack of adequate monitoring and enforcement capabilities limits the ability of the government to properly regulate the offshore fisheries, and it can be assumed that much unregulated fisheries is surreptitiously conducted.

The country is currently at an inflection point where the potential for greatly increased economic development and consequent disturbances to the marine and terrestrial environments loom large. Undersea oil resources have been located in territorial waters to the north of Príncipe adjacent to the EEZ of Nigeria. There are talk of building a deepwater port and oil-storage facilities on São Tomé. It can only be hoped that revenues accrued from oil will be used wisely to enhance the economic condition of the country's inhabitants and not destroy the pristine nature of the islands and its waters. It is important to record the country's biodiversity and advertise its uniqueness to the general populous, so as to instill a conscience of ownership and to ensure its proper preservation and use; the exploitable natural resources must also be documented and their condition monitored over time, so as to provide managers and lawmakers with information that will lead to the enactment of sustainable regulations of these resources. A major goal of the R/V *Dr Fridtjof Nansen* surveys in São Tomé and Príncipe has been to provide the faunal-assessment information that is vital to understand, regulate, and protect the marine resources of São Tomé and Príncipe . There is a urgent need to follow up these surveys in the years to come.

														Total for
Area	Year	Seabreams	Grunts	Croakers	Groupers	Snappers	Brachy. aur.	Sharks	Rays	Barracudas	Cephalopod	Ariomma	Carangids	the groups
Príncipe	2010	350	0	0	40	40	0	0	5	3	51	0	30	518
	2007	1124	0	0	78	658	0	1366 1)	6	0	39	0	41	1946 1)
	2006	794	0	0	0	4	0	0	16	0	129	2	14	959
	2005	1223	0	0	0	0	0	0	0	0	132	0	23	1378
	2004	1106	0	0	0	0	-	0	0	0	75	0	18	1199
São														
Tomé	2010	290	74	0	44	408	0	0	1	33	45	0	91	986
	2007	449	21	0	37	159	0	4	5	1	29	0	25	730
	2006	471	5	0	4	202	1	0	8	12	45	0	81	829
	2005	456	42	0	131	4895 1)	76	0	0	0	92	0	13	810 1)
	2004	397	19	0	127	147	-	6	4	0	66	0	21	787

Table 3.3 São Tomé and Principe, biomass estimates from the swept area trawl survey in 2004, 2005, 2006, 2007 and 2010.

1) Values not included in the total. The biomass is due to one very large catch and is not considered representative for the overall abundance.

4.6 Fishing trials São Tomé

As part of the survey a fishing trial was conducted to determine changes in catch rates and species composition of demersal fish over a 24 h period. Two trawl stations were selected at about 70 m, (station 1) and 60 m bottom depth (station 2) and was trawled repeatedly every 5 h from 18/5 – 19/5. Station 1 was slightly closer to the shelf break, but conditions on the two stations was otherwise similar. The catch was worked up in the same manner as during all the other trawl stations and catch rates were compared from haul to haul. Night-time was defined as from 17:30 until 05:30 in the morning. Figure 4.1 show a screen shot of the ships plotter depicting the two trawl stations that were used during the fishing trial. The bottom was mapped en-route between the two stations and is shown here with colours describing "bottom hardness" Red been the hardest and steepest areas while blue indicate flat and softer surfaces. The bottom substrate on both selected stations was sandy.





A plotter screenshot showing the topography of the shelf and bottom "hardness" the two stations that were trawled repeatedly during the dial experiment. Station 1 at the upper right corner and station two at the lower left.

Temperature recordings by CTD showed that the temperature was relatively stable over the time period but became slightly cooler, especially at station 1. The relative fluorescence showed an concentration of the phytoplankton layer during the night and a slight upward movement (vertical migration), Figure 4.2.

a) Station 1







Figure 4.4 Temperature and relative fluorescence profiles from the two diel stations conducted. a) station 1, b) Station 2.

The total biomass in the trawl catches varied between the two experimental stations but did otherwise show similar trends (Figure 4.3). Please note the y-axis log scale. The figure only show selected species and trends may be different than shown here for others. In Station 1 the first catch at midday on the 18th was the best catch. Thereafter the catch declined before increasing again at night, decreasing in the morning before a gradual increase throughout the day. This trend was followed by most species. Looking closely at the catch of Congo dentex, *Dentex congoensis*. One observes a clear diurnal variation in catch rate. The catch of this species mainly consisted of juvenile specimens and it is expected that the increasing catch rate during the night is due to juveniles migrating upwards from deeper waters for feeding. Both the *Dactylopterus volitans*, *Pagelus belottii* and the West African goatfish, *Pseudupeneus prayensis*, show similar migration pattern with decreasing catches at sunset and increasing later in the night before another dip can be observed in the morning. During the day increasing catch rates are experienced. This pattern is probably due to increased feeding migration at dusk and dawn. The fish move up in the water column in search for food and are less accessible for the trawl.

At station two overall catch rates are slightly decreasing throughout the period. A small dip can be seen in catch rates during the middle of the night. Both *Dactylopterus volitans*, and the *Pseudupeneus prayensis* show similar trends as at station 1 while the *Pagelus bellottii* show a less clear trend and a clear decline in catches that may indicate that this species is been moving away from the area probably due to the disturbance by the trawling. *Galeoides decadactylus* show an asynchron catch rate with the other species. Catches are decreasing during the night, increasing in the morning and stay at higher than night level during the rest of the day. Similar the *Pagrus caeruleostictus* showed a declining trend during the night and an increasing trend during the day but with very gradual changes.





Figure 4.3 Catch experiments showing catch rates in total and for some selected species over the 30 h period.

Figure 4.4 shows the numbers of species and species groups found during the two diurnal stations. It shows a similar trend on both stations with increasing catch rates during the night. About twice the numbers of species were found during the night stations. This is probable species that can be found in deeper depths during day and that migrates up on the shelf during the night to feed. Among these were many smaller species, Myctophides etc.

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Figure 4.4 Numbers of species and species groups found during the two diurnal stations.

Annex I Records of fishing stations

R/V Dr. Fridtjof Nansen DATE :11.05.2010	SURVEY: GEAR TYPE:	2010405 BT NO:	24 POS	STATION: SITION:Lat	1 N 1°31.	57
start stop TIME :09:10:03 09:37:46	duration 27.7 (min)		Purpos	Lon se : 3	E 7°28.	35
LOG : 9598.96 9600.31 FDEPTH: 58 61	1.4		Region Gear c	n : 3220 cond.: 0		
BDEPTH: 58 61 Towing dir: 0° Wire	out : 160) m	Validi Speed	ty : 0. : 2.9 k	n	
Sorted : 19 Total	catch: 19.	45	Catch/	'hour: 42.10)	
SPECIES		wei	CATCH/H	IOUR % OF Numbers	TOT. C	SAMP
Sepia officinalis Pagellus bellottii		1	.6.77 8.16	24 24	39.85 19.38	4
Pagrus caeruleostictus Caranx crysos			7.36 5.95	9 4	17.48 14.14	3 1
Fistularia petimba Rypticus saponaceus			3.25 0.26	11 2	7.71 0.62	
Diodon holocanthus Alloteuthis africana			0.17 0.11	2 45	0.41 0.26	
Dentex congoensis			0.06	2	0.15	
Total		4	2.10		100.00	
R/V Dr. Fridtjof Nansen	SURVEY:	2010405		STATION:	2	
DATE :11.05.2010 start stop	GEAR TYPE: duration	BT NO:	24 POS	ITION:Lat Lon	N 1°32. E 7°27.	60 62
TIME :11:04:10 11:30:16 LOG : 9609.95 9611.23	26.1 (min) 1.3		Purpos Region	ie : 3 1 : 3220		
FDEPTH: 48 57 BDEPTH: 48 57			Gear c Validi	ty : 0		
Towing dir: 0° Wire Sorted : 6 Total	out : 135 catch: 5.6	6 m 58	Speed Catch/	: 2.9 k hour: 13.06	in 5	
SPECIES			CATCH/H	IOUR % OF	TOT. C	SAMP
Pagrus caeruleostictus		Wei	.gnt r 7.75	16	59.32	5
Decapterus punctatus			0.53	2	4.05	0
Chilomycterus spinosus	mauret.		0.23	2	1.76	
Squillidae			0.00	2	0.02	
Total		1	3.06	_	100.00	
D/M Dr. Fridrick Norson	CUDURY	2010405		CENTON.	2	
DATE :11.05.2010 start stop	GEAR TYPE:	BT NO:	24 POS	ITION:Lat	N 1°41. E 7°28.	18 74
TIME :12:52:49 13:23:45 LOG : 9620.86 9622.42	30.9 (min) 1.6		Purpos Region	ie : 3 : 3220		
FDEPTH: 51 48 BDEPTH: 51 48			Gear c Validi	ond.: 0		
Towing dir: 0° Wire Sorted : 165 Total	out : 155 catch: 164	m 1.58	Speed Catch/	: 3.0 k hour: 319.3	:n 87	
SPECIES			CATCH/H	IOUR % OF	тот. с	SAMP
Dactylopterus volitans		wei 27	.ght r 1.67	umbers 1063	85.07	7
Pagrus caeruleostictus Acanthostrascion guinee	nsis	1	4.65	23 82	4.59 3.34	8
Sepia officinalis Fistularia petimba			8.25 3.16	10 10	2.58 0.99	11
Pagellus bellottii Balistes capriscus			3.14 2.81	12 6	0.98 0.88	9
Description of the state of the			1.67	4	0.52	10
Caranx crysos			1.40	4	0.44	
Caranx crysos Balistes punctatus Seriola carpenteri			1.40 0.85 0.49	4 2 2	0.44 0.27 0.15	
Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomycterus spinosus	mauret.		1.40 0.85 0.49 0.45 0.16	4 2 2 2 2	0.44 0.27 0.15 0.14 0.05	
rsettodes Deicheri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomycterus spinosus Total	mauret.	31	1.40 0.85 0.49 0.45 0.16	4 2 2 2	0.44 0.27 0.15 0.14 0.05	
resttodes Deicheri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomycterus spinosus Total	mauret.	31	1.40 0.85 0.49 0.45 0.16	4 2 2 2 2	0.44 0.27 0.15 0.14 0.05	
resttodes beicheri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomycterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010	mauret. SURVEY: GEAR TYPE: GURATION	31 2010405 BT NO:	1.40 0.85 0.49 0.45 0.16 9.37	4 2 2 2 STATION: SITION:Lat	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43.	00
resticodes belicheri Caranx crysos Balistes punctatus Seriola carpenteris Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15:21:16 15:52:16 DG : 9635.42 9637.09	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7	31 2010405 BT NO:	1.40 0.85 0.49 0.45 0.16 9.37 24 POS Purpos Begior	4 2 2 2 STATION: SITION:Lat Lon se : 3 2 2 2 3220 3200 320	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26.	00 09
resticodes belicheri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15:21:16 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7	31 2010405 BT NO:	1.40 0.85 0.49 0.45 0.16 9.37 24 POS Purpos Regior Gear c Validi	4 2 2 2 STATION: IITION:Lat Lon 16 : 3 1 : 3220 cond.: 0 t.v.: 0	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26.	00 09
resticodes belicheri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15:21:16 15:52:16 LOG : 9635.42 9637.69 FDETH: 26 36 Towing dir: 0° Wire Sorted : 82 Total	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 out : 130 catch: 322	31 2010405 BT NO: 0 m 3.23	1.40 0.85 0.49 0.45 0.16 9.37 24 POS Regior Gear c Validi Speed Catch/	4 2 2 2 2 STATION: SITION:Lat Lon te : 3 a : 32200 .ty : 0 .ty	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26.	00 09
rsettodes belcheri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomycterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 Start stop TIME :15:21:16 15:52:16 LOG : 9635.42 9637.09 FDETH: 26 36 DDETH: 26 36 Towing dir: 0* Wire Sorted : 82 Total SPECIES	Mauret. SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 out : 133 catch: 323	31 2010405 BT NO: 0 m 3.23	1.40 0.85 0.49 0.45 0.16 9.37 24 FOS Purpos Regior Gear c Validi Speed Catch/H	4 2 2 2 2 3 3 3 3 3 3 3 3 3 2 2 2 2 3 2 3 3 3 3 3 3 3 2	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26.	00 09 SAMP
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Paettodes Deleneri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15:21:16 15:52:16 LOG : 9635.42 9637.26 FDETH: 26 36 BDETH: 26 36 Towing dir: 0° Wire Sorted : 82 Total SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 out : 133 catch: 323 nsis		1.40 0.85 0.49 0.45 0.16 9.37 24 POS Purpos Regior Gear c Validi Speed Catch/H ght r 5.16 0.77 8.87	4 2 2 2 2 3 3 3 3 3 3 3 2 3 2 3 2 3 2 3	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. TOT. C 66.36 19.31 3.02	00 09 SAMP 16
Paettodes Deleneri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15:21:16 15:52:16 LOG : 963:42 9637.09 FDETH: 26 36 BDETH: 26 36 Towing dir: 0* Wire Sorted : 82 Total SPECIES Acanthostrascion guinee Datylopterus volitans Decapterus macarellus	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 out : 13(catch: 32) nsis	31 2010405 BT NO: 0 m 3.23 wei 41 41 12 1 1	1.40 0.85 0.49 0.45 0.16 9.37 24 POS Purpos Regior Gear c Validi Speed Catch/H ght r 5.16 0.77 8.87 5.48 0.84	4 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. * TOT. C 66.36 19.31 3.02 2.48 1.73	00 09 SAMP 16 17
resticos delineri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15:21:16 15:52:16 LOG : 963:42 9637.09 FDETH: 26 36 BDETH: 26 36 Towing dir: 0° Wire Sorted : 82 Total SPECIES Acanthostrascion guinee Datylopterus volitans Lethrinus atlanticus Diodon holocanthus Decapterus macarellus Sepia officinalis Carangoides bartholomae	SURVEY GEAR TYPE: duration 31.0 (min) 1.7 out : 130 catch: 322 nsis		1.40 0.85 0.49 0.45 9.37 24 FOS Purpos Regior Gear c Validi Speed Catch/ Catch/ f 5.16 0.77 8.87 5.48 0.35 9.87	4 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 7 TOT. C 66.36 19.31 3.02 2.48 1.73 1.66 1.58	00 09 SAMP 16 17 19 9
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resticose Seleneri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.216 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DEFTH: 26 36 DEFTH: 26 36 DEFTH: 26 36 DEFTH: 27 Wire Sorted : 82 Total SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus Diodon holocanthus Decapterus macarellus Sepia officinalis Carangoides bartholome Fistularia tabacaria Balistes capriscus Stephanolejis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Total 36 DEFTH: 40 38 DDEFTH: 40 38 DDEFTH: 49 Total SPECIES	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 nsis i survey: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48.	 BT NO: D m 1.23 wei 41 12 12 12 11 1 1 1 2010405 BT NO: 0 m 66 wei	1.40 0.85 0.49 0.45 0.45 24 POS Purpos Region Gearc Catch/ CATCH/H ght f 2,16 0.77 5.48 0.85 0.85 0.85 0.85 0.85 0.85 0.85 0.8	4 2 2 2 2 3 STATION: ITION.Lat Lon i: 3220 cond.: 0 i: 320 cond.: 0 cond.: 0 cond.: 0 i: 320 cond.: 0 cond.: 0 c	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 3.02 2.48 1.93 1.66 6.39 19.31 3.02 2.48 1.18 0.80 0.46 0.31 3.02 2.48 1.18 0.46 0.31 0.22 0.48 1.18 0.46 0.31 0.24 0.31 0.46 0.31 0.46 0.31 0.46 0.58 1.18 0.42 0.58 1.18 0.42 0.58 1.18 0.42 0.58 0.14 0.55 0.14 0.55 0.14 0.55 0.14 0.55 0.15 0.15 0.15 0.15 0.05 0.15 0.15	00 09 SAMP 16 17 19 67 14 13 18 15 74 19 25
resticose Science Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.216 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DDETH: 26 36 DETH: 26 36 DETH: 27 30 Sted : 82 Total SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus Diodon holocanthus Decapterus macarellus Sepia officinalis Carangoides bartholome Fistularia tabacaria Balistes capriscus Stephanolejis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Total SPECIES Acanthostrascion guinee Septema: 49 Total SPECIES Acanthostrascion guinee Fagrus caeruleostictus	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 nsis i survey: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	 BT NO: D m 1.23 wei 41 12 12 12 12 11 1 1 1 2010405 BT NO: 0 m 66 wei 61 0 m 66	1.40 0.85 0.49 0.45 0.45 24 POS Purpos Region Gearc Catch/ CATCH/H ght f 2,10 0.72 0.75 5.48 0.85 0.85 0.85 0.85 0.85 0.85 0.85 0.8	4 2 2 2 3 STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 320 cond.: 0 cond.: 0	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 3.02 2.48 1.93 1.66 19.31 3.02 2.48 1.93 1.66 1.931 3.02 2.48 1.18 0.80 0.46 0.39 0.31 0.46 0.39 0.31 0.46 0.58 1.18 0.12 0.14 0.05 1.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0.00 0.05 0	00 09 SAMP 16 17 19 67 14 13 18 15 74 19 20 20
resticose Science Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.216 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DDETH: 26 36 DETH: 26 36 DETH: 27 30 Sted : 82 Total SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus Diodon holocanthus Decapterus macarellus Sepia officinalis Carangoides bartholome Fistularia tabacaria Balistes capriscus Stephanolejis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Total 38 DETH: 40 38 DETH: 40 38 DETH: 49 Total SPECIES Acanthostrascion guinee Fagrus caeruleostictus Sepice y Start stop Toving dir: 0° Wire Sorted : 49 Total SPECIES Acanthostrascion guinee Fagrus caeruleostictus Dactylopterus volitans Fistularia tabacari	SURVEY: GEAR TYPE: duration 31.0 (min) 1.7 nsis i survey: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	31 2010405 BT NO: 0 m 1.23 vei 41 12 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.40 0.85 0.49 0.45 0.45 7 24 POS Purpos Region Gearc Catch/ CATCH/H ght f 2,16 0.77 0.75 2,86 2,44 0.35 5,03 2,86 2,44 0.35 5,03 2,286 2,24 0.95 5,03 2,286 2,24 0.95 5,03 2,286 2,24 0.95 5,03 2,286 2,24 0.95 5,03 2,286 2,24 0.95 5,03 2,286 2,24 0.95 5,03 2,286 2,	4 2 2 2 2 3 STATION: ITION.Lat Lon i: 3220 cond.: 0 i: 320 cond.: 0 i: 320 cond.: 0 i: 3220 cond.: 0 i: 320 cond.: 0 i: 320 cond.: 0 i: 320 cond.: 0 i: 320 cond.: 0 cond.: 0 cond.	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 3.02 2.48 1.93 1.66 19.31 3.02 2.48 1.93 1.66 1.931 3.02 2.48 1.93 1.66 1.931 3.02 2.48 0.31 0.46 0.31 1.68 1.18 0.46 0.31 0.46 0.31 0.46 0.31 0.46 0.31 0.46 0.31 0.46 0.31 0.46 0.58 1.18 0.42 0.42 0.58 1.18 0.42 0.45 0.44 0.45 0.44 0.45 0.44 0.45 0.45	00 09 SAMP 16 17 19 67 14 13 18 15 74 19 SAMP 20 25
resticose Science Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.216 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DDETH: 26 36 DETH: 26 36 DETH: 26 36 DETH: 27 Wire Sorted : 82 Total SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus Diodon holocanthus Decapterus macarellus Sepia officinalis Carangoides bartholome Fistularia tabacaria Balistes capriscus Stephanolejis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Total SPECIES Acanthostrascion guinee Fagrus caeruleostictus SPECIES Acanthostrascion guinee Fagrus caeruleostictus Dactylopterus volitans Fistularia tabacaria Diodon holocanthus Detrinus atlanticus	SURVEY: GEAR TYPE: duration 0ut : 13 catch: 32: nsis i survey: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	31 2010405 BT NO: 0 m 1.23 wei 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.40 0.85 0.45 0.45 0.45 7 24 POS Purpos Region Gearc Catch/ CATCH/H ght r 5.16 0.77 7.35 2.86 2.44 0.35 7.55 7.55 2.86 2.44 0.35 7.55 7.55 7.55 7.55 7.55 7.55 7.55 7	4 2 2 2 2 3 STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 320 cond.: 0 cond.: 0 i: 320 cond.: 0 i: 320 cond.: 0 cond.: 0	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 2.48 1.66 19.31 2.48 1.66 19.31 3.02 2.48 1.66 1.58 1.68 0.46 0.39 0.46 0.31 1.66 1.58 1.68 0.46 0.39 0.24 0.12 0.12 0.14 0.05 100.00 5 5 7 TOT. C 6 6 1.60 1.58 0.46 0.39 0.39 0.02 0.02 100.00 5 5 7 TOT. C	00 09 SAMP 16 17 19 97 14 13 18 15 74 19 SAMP 20 25 22
resticose Science Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.216 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DDETH: 26 36 DETH: 26 36 DETH: 27 30 Sted : 82 Total SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus Diodon holcanthus Decapterus macarellus Sepia officinalis Carangoides bartholome Fistularia tabacaria Balistes punctatus Caranx crysos Stephanolejis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Torei 9647.13 9648.67 SPECIES Acanthostrascion guinee Fagrus caeruleosticus SPECIES Acanthostrascion guinee Fagrus caeruleosticus Datylopterus volitans Datylopterus volitans Fistularia tabacaria BDETH: 40 38 DDETH: 40 38 DDETH: 40 38 DDETH: 40 38 DDETH: 40 38 DETH: 40 38 D	SURVEY: GEAR TYPE: duration out : 13(catch: 32: nsis i survey: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	31 2010405 BT NO: 0 m 1.23 wei 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.40 0.85 0.49 0.45 0.45 7 24 POS Purpos Region Gearc Catch/ CATCH/H ght r 5.16 0.77 5.48 0.35 5.48 0.49 5.48 0.45 5	4 2 2 2 2 3 STATION: ITION.Lat Lon i: 3220 cond.: 0 i: 320 cond.: 0 cond.:	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 3.02 2.48 1.66 19.31 3.02 2.48 1.66 19.31 3.02 2.48 1.68 1.58 1.68 1.58 1.68 0.46 0.31 3.02 2.48 0.46 0.31 0.46 0.31 1.68 1.58 1.68 0.46 0.39 0.42 0.12 0.14 0.05 1.68 0.46 0.58 1.68 0.46 0.58 1.68 0.46 0.58 1.68 0.42 0.58 1.68 0.42 0.58 1.68 0.58 0.42 0.58 0.42 0.58 0.58 0.42 0.58 0.58 0.58 0.58 0.58 0.58 0.58 0.58	00 09 SAMP 16 17 19 67 14 13 18 15 74 19 20 25 22 21
resticose seliceri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.2116 15:52:16 LOG : 9635.42 9637.09 FDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DDEFTH: 26 36 DEFTH: 27 30 SPECIES Acanthostrascion guinee Dactylopterus volitans Lethrinus atlanticus Diodon holcoanthus Decapterus macarellus Sepio ficinalis Carangoides bartholome Fistularia tabacaria Balistes punctatus Caranx crysos Stephanoleyis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Time :17.0216 17:50:07 LOG : 9647.13 9648.67 JONING if 0 Wire Sorted : 49 Total SPECIES Acanthostrascion guinee Fagrus caeruleostictus Datylopterus volitans Fistularia tabacaria BDEFTH: 40 38 DDEFTH: 40 38 DDEFTH 40 38 DDEFTH 40 38 DDEFTH 40 38 DDEFTH 40 38 DDEF	SURVEY: GEAR TYPE: duration out : 13 catch: 32: nsis i SURVEY: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	31 2010405 BT NO: 0 m 1.23 wei 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.40 0.85 0.49 0.45 0.45 7 24 POS Purpos Region Gearc Catch/ CATCH/H ght f 2.4 POS Catch/ CATCH/A 0.35 5.16 0.77 0.35 2.86 2.44 0.35 5.38 0.35 5.33 0.45 5.35 0.35 5.33 0.45 5.48 0.35 5.34 0.35 5.34 0.35 5.35 0.45 5.35 0.45 0.35 5.35 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.4	4 2 2 2 2 3 STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 320 cond.: 0 cond.: 0 c	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 3.02 2.48 1.66 19.31 3.02 2.48 1.66 19.31 3.02 2.48 1.68 1.58 1.68 1.58 1.68 0.46 0.39 0.46 0.39 0.42 0.12 0.12 0.14 0.15 0.12 0.14 0.05 100.00 5 5 7 TOT. C	00 09 SAMP 16 17 19 67 14 13 18 15 74 19 20 25 22 21 24 24 26
Pattodes Deleneri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 Start stop TIME :15:21:16 15:52:16 LOC : 963:42 9637.0 FDETH: 26 36 BDETH: 26 36 BDETH: 26 36 BDETH: 26 36 Sorted : 82 Total SFECIES Acanthostrascion guinee Dactylopterus volitans Didon holocanthus Decapterus macarellus Sepia officinalis Carangoides bartholomae Fistularia tabacaria Balistes capriscus Pagrus caeruleosticus Selar crumenophthalmus Sphyraena sphyraena Boths guibei Balistes punctatus Carangoides bartholomae Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 Start stop Tisularia petimba Torpedo sp. Total SPECIES Acanthostrascion guinee Pagrus caeruleostictus Date :10.5.2010 Start stop Tisulari of Wire Sorted : 49 Total SPECIES Acanthostrascion guinee Fagrus caeruleostictus Dactylopterus volitans Fistulari tabacaria Diodon holocanthus Lethrinus atlanticus Pagelus bellottii Fistularia petimba Sphyraena sphyreena Sepia officinalis Bothus guibei Aluterus weudelotii	mauret. SURVEY: GEAR TYPE: duration 1.7 out : 13(catch: 32: nsis i SURVEY: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	31 2010405 BT NO: 0 m 1.23 wei 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.40 0.85 0.49 0.45 0.45 7 24 POS Purpos Region Gearc Catch/ CATCH/H ght r 2.4 POS Catch/ CATCH/A 0.35 2.46 0.37 7.35 2.46 0.38 2.46 0.35 2.46 0.35 7.35 2.46 0.32 2.46 0.35 2.46 0.32 2.46 0.35 2.46 0.32 2.46 0.32 2.46 0.36 2.46 0.36 2.46 0.36 2.27 2.22 3.46 0.36 2.22 1.41 1.10 0.36 2.22 2.22 1.22 2.22 1.22 2.22 2.22 2.2	4 2 2 2 2 2 3 STATION: ITION:Lat Lon i: 3220 cond.: 0 : 3:22k hour: 625.6 KOUR % OF 10 17 17 15 8 8 10 2 64 0 74 74 27 15 17 17 15 8 8 10 2 592 64 0 74 74 27 15 17 17 15 8 8 10 2 5 92 64 0 74 74 2 5 92 64 0 74 74 2 5 92 64 0 74 74 2 5 92 64 0 74 74 2 5 92 64 0 74 74 2 5 92 64 0 74 74 2 5 8 8 10 17 17 15 8 8 10 2 2 5 8 10 17 17 15 8 8 10 2 2 5 92 64 0 74 74 2 5 92 64 0 74 74 2 5 8 8 10 2 2 5 8 8 10 17 17 15 5 8 8 10 2 2 5 7 17 17 15 15 17 17 15 15 17 17 15 8 8 10 2 2 2 2 2 2 2 2 2 2 5 7 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 17 17 15 15 15 17 17 15 15 15 17 17 15 15 15 17 15 15 15 17 17 15 15 15 17 15 15 15 17 17 15 15 15 15 15 15 15 15 15 15	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 2.48 1.66 19.31 2.48 1.66 19.31 2.48 1.66 19.31 3.02 2.48 1.66 1.58 1.68 0.46 0.39 0.46 0.39 0.46 0.39 0.46 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.46 0.58 0.58 0.58 0.58 0.58 0.58 0.58 0.58	00 09 SAMP 16 17 19 97 14 13 18 15 74 19 20 25 22 21 24 426
Prettodes Deleneri Caranx crysos Balistes punctatus Seriola carpenteri Decapterus punctatus Chilomyterus spinosus Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop TIME :15.216 15:52:16 LOG : 9635.42 9637.09 FDETR: 26 36 BDETR: 26 36 BDETR: 26 36 BDETR: 26 36 BDETR: 26 36 BDETR: 26 36 Carantostrascion guinee Datylopterus volitans Lethrinus atlanticus Diodon holcoanthus Decapterus macarellus Sepia officinalis Carangoides bartholome Fistularia tabacaria Balistes capriscus Stephanoleyis hispidus Fistularia tabacaria Balistes punctatus Caranx crysos Stephanoleyis hispidus Fistularia petimba Torpedo sp. Total R/V Dr. Fridtjof Nansen DATE :11.05.2010 start stop Time :17.05.071 LOG : 9647.13 9648.67 SPECIES Acanthostrascion guinea Fayrus caeruleostictus Datylopterus volitans Fistularia tabacaria BDETR: 40 38 BDETR: 49 Total SPECIES Acanthostrascion guinea Fayrus caeruleostictus Datylopterus volitanis Pagellus bellottii Fistularia petimba Sphyraena sphyreena Sepia officinalis Bochus guibei Aluterus Heudelottii Fistularia petimba Sphyraens phyreena Sepia officinalis Bochus guibei Aluterus Heudelottii Fistularia petimba Sphyraens phyreena Sepia officinalis Bochus guibei Aluterus Pagelus pergensis Decapterus punctatus	Mauret. SURVEY: GEAR TYPE: duration out : 13(catch: 32: nsis i survey: GEAR TYPE: duration 29.9 (min) 1.6 out : 12(catch: 48. nsis	31 2010405 BT NO: 0 m 1.23 wei 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.40 0.85 0.49 0.45 0.45 7 24 POS Purpos Region Gearc Catch/ CATCH/H ght f 2.4 POS Catch/ CATCH/H Ght Catch/ CATCH/H 0.35 2.86 2.44 0.35 5.03 2.86 2.44 0.35 5.03 2.86 2.44 0.35 5.03 2.46 0.95 0.72 0.56 0.72 0.59 2.4 POS 2.46 0.35 2.47 0.55 0.37 2.47 0.56 0.37 2.47 0.56 0.37 2.47 0.56 0.37 2.47 0.30 2.47 0.57 0.30 2.47 0.57 0.30 2.47 0.35 2.48 0.35 2.46 0.35 2.46 0.35 2.46 0.35 2.46 0.35 2.46 0.35 2.46 0.35 2.46 0.37 2.47 0.30 0.10 0.55 0.30 2.47 0.55 0.37 2.47 0.56 0.37 2.47 0.36 0.37 2.47 0.36 0.37 2.47 0.36 0.37 2.47 0.36 0.37 2.47 0.36 0.37 2.47 0.37 0.37 0.37 0.37 0.37 0.37 0.37 0.3	4 2 2 2 2 3 STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 3220 cond.: 0 cond.: 0	0.44 0.27 0.15 0.14 0.05 100.00 4 N 1°43. E 7°26. 4 7 TOT. C 66.36 19.31 2.48 1.73 1.63 1.63 1.63 1.63 1.63 1.63 1.63 1.6	00 09 3 3 4 16 17 19 67 14 13 18 15 74 19 20 25 22 21 24 26 25 22 21 24 26 23 27

	GEAR TYPE: BT	NO: 24 POS	ITION:Lat	N 1°40.	71
start stop TIME :07:01:47 07:31:36	duration 29.8 (min)	Purpos	Lon e : 3	E 7°17.8	36
LOG : 9712.34 9713.83 FDEPTH: 63 57	1.5	Region Gear c	: 3220		
Towing dir: 0° Wire	out : 170 m	Speed	: 3.0 1	kn	
SPECIES	i caccii. 114./1	CATCH/H	IOUR % 01	F TOT. C	SAME
Dactylopterus volitans		weight r 74.47	umbers 322	32.26	30
Paranthias furcifer Lutjanus fulgens		52.13 47.40	368 83	22.58 20.53	29 28
Pagellus bellottii Pagrus caeruleostictus		14.39 13.18	68 22	6.23 5.71	32 31
Sepia officinalis Seriola rivoliana		6.54 4.03	10	2.83	33
Acanthostrascion guine Trachinus radiatus	ensis	3.97 3.48	40 4	1.72	
Scyllarides herklotsii Rypticus saponaceus		2.68	14	1.16	35
Torpedo torpedo		0.93	2	0.40	
Pseudupeneus prayensis Aluterus heudelotii		0.60	4	0.26	34
URCHINS Torpedo spotted		0.58	2	0.25	
Stephanolepis hispidus Diodon holocanthus		0.56	4 6	0.24 0.24	
Alloteuthis africana Chilomycterus spinosus	mauret.	0.34	147	0.15	
CONGRIDAE		0.14	20	0.05	
Antnias antnias	_	220.00		100.02	
IULAI		230.00		100.00	
R/V Dr. Fridtjof Nansen DATE :12.05.2010	SURVEY:2010 GEAR TYPE: BT	0405 NO:24 POS	STATION: ITION:Lat	7 N 1°33.4	11
start stop TIME :09:11:08 09:41:32	duration 30.4 (min)	Purpos	Lon e : 3	E 7°17.0	54
LOG : 9725.36 9726.86 FDEPTH: 67 65	1.5	Region Gear c	ond.: 0		
BDEPTH: 67 65 Towing dir: 0° Wire Sorted 54 Tota	out : 180 m	Speed Speed	ty : 0 : 3.0 1	kn 1 9	
SPECIES	1 catch. 54.25	CATCH/H	IOUR % 01	F TOT. C	SAME
Pagellus bellottii		weight r 58.34	umbers 399	54.43	36
Dactylopterus volitans Pagrus caeruleostictus		21.03 15.00	67 14	19.62 14.00	37 38
Lutjanus fulgens Torpedo torpedo num. s	pots	1.88	2 4	1.75 1.57	39
Fistularia petimba SALPS		1.68	6	1.57	
Alloteuthis africana Bodianus speciosus		1.54	4	1.44	40
Zeus capensis Tornedo 5 weak spots		0.79	2	0.74	
Syacium micrurum Dentex congoensis		0.47	4	0.44	41
Fistularia sp., juveni	le	0.04	4	0.04	
Total		107.19		100.00	
R/V Dr. Fridtjof Nansen DATE :12.05.2010	SURVEY:2010 GEAR TYPE: BT	0405 NO: 24 POS	STATION:	8 N 1°33.4	16
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20	SURVEY:2010 GEAR TYPE: BT duration 30.1 (min)	0405 NO: 24 POS Purpos	STATION: SITION:Lat Lon se : 3	8 N 1°33.4 E 7°15.0	16 00
R/V Dr. Fridtjof Nansen DATE :12.05.2010 Start stop TIME :13:21:13 13:51:20 LOG : 9744.68 9746.17 PDEPTH: 81 80	SURVEY:2010 GEAR TYPE: BT duration 30.1 (min) 1.5	0405 NO: 24 POS Region Gear C	STATION: Lon te : 3 . : 3220 cond.: 0	8 N 1°33.4 E 7°15.(16 00
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20 LOG : 974.68 974.61 FDEPTH: 81 80 Towing dir: 0° Wire Sorted at 108	SURVEY:201(GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 0.2 crtch: 108 60	0405 NO: 24 POS Region Gear c Validi Speed	STATION: ITTION:Lat Lon e : 3 220 ond: 0 .ty : 0 : 3.0 1 box: 216	8 N 1°33.4 E 7°15.0	16 00
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPFCIES	SURVEY:2010 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69	D405 NO: 24 POS Region Gear c Validi Speed Catch/	STATION: Lon Lon : 3220 cond.: 0 t.ty : 0 	8 N 1°33.4 E 7°15.0 kn 52	16 00 SAME
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20 LOG : 9744.68 9746.10 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii	SURVEY:201(GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69	0405 NO: 24 POS Region Gear c Validi Speed Catch/ CATCH/H weight n 187.25	STATION: ITION:Lat Lon e : 3 cond.: 0 : 3.0 1 hour: 216. Hour: 216. 1518	8 N 1°33.4 E 7°15.0 kn 52 F TOT. C 86.48	16 00 SAME 42
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitams Pagrus caeruleostictus	SURVEY;201(GERA TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69	0405 NO: 24 POS Region Gear c Validi Speed Catch/ weight r 187.25 17.13 4.98	STATION: IITION:Lat Lon e : 3 i: 3220 iond.: 0 :ty : 0 : 3.0 hour: 216.5 NOUR % 00 numbers 1518 42 4	8 N 1°33.4 E 7°15.0 Kn 55 F TOT. C 86.48 7.91 2.30	16 00 SAME 42 44 43
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop IIME :13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFPH: 81 80 Towing dir: 0° Wire BDEFPH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus wolitams Pagrus caeruleostictus Alloteuthis africana Fistularia petimba	SURVEY:2010 GEAR TYFE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69	D405 NO: 24 POS Region Gear c Validi Speed Catch/ CATCH/F weight r 187.25 17.13 4.98 2.59 1.59	STATION: HITION:Lat Lon H 3220 Outry 0 : 3220 	8 N 1°33.4 E 7°15.0 F TOT. C 86.48 7.91 2.30 1.20 0.74	46 00 SAME 42 44 43
R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop IIME :13:21:13 13:51:20 DOG : 9744.68 9746.17 FDEFPH: 81 80 Towing dir: 0° Wire BDEFPH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus wolitams Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum	SURVEY:2010 GEAR TYFE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69	0405 NO: 24 FOS Region Gearc Validi Speed CATCH/F 197.25 17.13 4.98 2.59 1.02 0.94	STATION: LITION:Lat Lon e : 3 : 3220 ond:0 : 3.00 ty : 0 : 3.00 hour: 216. NOUR % 0 umbers 1518 42 4 1683 6 22 6	8 N 1°33.4 E 7°15.0 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.43 0.43	16 00 SAME 42 44 43 46
R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME t13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFTH: 81 80 Towing dir: 0° Wire BDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Arioma bondi	SURVEY:2011 GEAR TYPE; BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69	0405 NO: 24 FOS Region Gear c Validi Speed Catch/ 17.13 4.98 2.59 1.02 0.94 0.94 0.92	STATION: ITION:Lat Lon i: 3220 i: 3220 i: 3220 i: 3200 i: 32000 i: 3200 i:	8 N 1°33. E 7°15.0 kn 52 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.43 0.37 0.30	16 00 SAME 42 44 43 46 45
R/V Dr. Fridtjof Nansen DATE 12.05.2010 Start stop ILGG : 9744.68 9746.17 FDEFTH: 81 80 Towing dir: 0* Wire BDEFTH: 81 80 Towing dir: 0* Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis Africana Fistularia petimba Dentex congoensis Syacium micrurum Priscanthus arenatus Arioma bondi	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69	0405 NO: 24 FOS Region Gear c Validi Speed Catch/ 17.13 4.98 2.59 1.02 2.59 1.02 0.94 0.01	STATION: ITION:Lat Lon i. 3220 cond.: 0 i. 3220 i. 3220 i. 3202 i.	8 N 1°33.4 E 7°15.0 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.43 0.37 0.06 0.10	SAMI 42 44 43 46 45 2
R/V Dr. Fridtjof Nansen DATE 12.05,2010 TME start stop TME 13:21:11:11:20 PDEFTH: 46.1 9746.17 PDEFTH: 61.9746.17 OTOWING dir: 0° Wire Sorted : 109 Tota SFECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congeensis Syacium micrurum Priacanthus arenatus Ariomma bondi SG& Tomé and Principe 0.05 Lepiotrigla carolae Total	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69 hanolepis hispic	0405 NO: 24 POS Region Gear c validi Speed Catch/ to 17.13 4.98 2.59 1.02 0.94 0.80 0.12 0.94 0.80 0.12	STATION: ITION:Lat Lon : 3220 : 3220 ond.: 0 ty : 0 hour: 216. OUR % OI umbars 42 4 4 1663 6 22 14 	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 0.74 0.43 0.37 0.06 0.10 0.00 100.00	SAME 422 44 45 46 45 2
R/V Dr. Fridtjof Nansen DATE 12.05,2010 Start stop TIME start stop TIME st3;21:13 13:12 DDFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SFECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congeensis Syacium micrurum Priacanthus arenatus Ariomma bondi SG& Tomé and Principe 0.05 Lepidotrigla carolae Total	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69 hanolepis hispic	0405 NO: 24 POS Region Gear c Validi Speed Catch/ 197.25 17.13 4.98 2.59 1.02 0.94 0.80 0.12 dus 0.01 216.52	STATION: LTTION:Lat LON 1: 3220 ond.: 0 ty : 0 hour: 216. OUR % 01 mbbrs 128 42 4 1683 6 2 2 14 - - -	8 N 1°33.4 E 7°15.0 F TOT. C 86.48 7.91 1.20 0.10 0.47 0.43 0.37 0.06 0.10 0.00	16 00 SAME 42 44 43 46 45 2
R/V Dr. Eridtjof Nansen DATE :12.05,2010 Start stop TIME :13:21:13 :13:12:0 TOPEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congeensis Syacium micrurum Priacanthus arenatus Arionma bondi Sa& Tomé and Principe 0.05 Lepidotrigla carolae Total	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 hanclepis hispic	0405 NO: 24 POS Region Gear c validi Speed Catch/ 187.25 17.13 4.98 2.59 1.59 1.02 0.94 0.80 0.12 dus 0.01 216.52	STATION: LTTION:Lat LOON 1: 3220 1: 3220 hour: 216. 00UR % 00 umbers 42 4 4 4 4 6 6 22 14 - - - - - - - - - - - - -	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.47 0.47 0.47 0.06 0.10 0.00	146 00 5AME 423 44 45 46 45 2
<pre>R/V Dr. Fridtjof Nansen DATE 12.05,2010 TME 13:21:13 13:51:20 TOG : 9744.68 9746.17 TPDEFTH: 81 80 DDEFTH: 91 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congeensis Syacium micrurum Priacanthus arenatus Ariorma bondi São Tomé and Principe 0.05 Lepidotrigla carolae Total</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69 hanolepis hispic	0405 NO: 24 POS Region Gear c Validi Catch/ catch/ catch/ 187.25 17.13 4.98 2.59 1.59 1.02 0.94 0.80 0.12 dus 0.12 dus	STATION: LTION:Lat LOON 3 220 a 3 220 a 3 220 a 3 220 b 1 3 20 b 2 3	8 N 1°33.4 E 7°15.6 S2 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.43 0.74 0.43 0.37 0.06 0.10 0.00	SAME 42 44 43 45 2
<pre>R/V Dr. Fridtjof Nansen DATE :12.05.2010</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 hanclepis hispid SURVEY:2011 GEAR TYPE: BT duration	0405 NO: 24 POS Region Gear c Validi Speed Catch/ 187.25 17.13 4.98 2.59 1.59 1.59 1.02 0.94 0.80 0.12 dus 0.01 216.52	STATION: ITION:Lat Lon is 3220 cond.: 0 ty : 0 t	8 N 1*33.4 E 7*15.6 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.47 0.47 0.47 0.47 0.00 0.10 0.00 100.00	16 00 SAME 42 44 43 46 45 2
 R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13.2113 13.5120 LOG : 9744.68 9746.17 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitams Palotylopterus volitams Alloteuthia africana Fistularia petimba Dentex congeensis Syacium micrurum Priacanthus arenatus Arioma bondi São Tomé and Principe 0.05 Lepidotrigla carolae Total R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TURE 1512157 15:43:06 Inc 0756 43 TOF6 43 	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 hanclepis hispid GEAR TYPE: BT duration 30.2 (min) 1.5	0405 NO: 24 FOS Region Gear c Validi Speed Catch/ 187.25 17.13 4.98 2.59 1.59 1.59 1.02 0.94 0.80 0.12 dus 0.01 216.52	STATION: ITION:Lat Lon is 3202 is 3220 is 3220 is 3202 is 3	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 1.20 0.47 0.43 0.70 0.10 0.00 100.00 9 N 1°29.7 E 7°11.3	16 00 53AME 42 44 45 2 2 73 11
 R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitams Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis adrima Datex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis down Sa Tomé and Principe 0.05 Lepidotrigla carolae Total R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :15:12:57 15:43:06 LOG : 9754.83 9756.33 FDEFTH: 85 94 	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 hanolepis hispid SURVEY:2011 GEAR TYPE: BT duration 30.2 (min) 1.5	0405 NO: 24 FOS Region Gear c Validi Speed Catch// U87.25 17.13 4.98 2.59 1.69 0.94 0.80 0.12 216.52 0.94 0.01 216.52	STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 3220 i: 32200 i: 3200 i: 3	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 1.20 0.20 0.20 0.20 0.10 0.00 100.00 9 N 1°29.7 E 7°11.3	5500 5500 422 43 46 45 2 2 73
<pre>R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TIME :13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis africana Sistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Ariomma bondi São Tomé and Principe 0.05 Lepidotrigla carolae Total</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 hanolepis hispid GURATION 30.2 (min) 1.5 out : 240 m l catch: 20.79	0405 NO: 24 FOS Region Gear c Validi Speed Catch/ 187.25 17.13 4.98 2.59 1.02 0.94 0.80 0.12 216.52 0.94 NO: 24 FOS NO: 24 FOS Region Cear c Validi 1.59 1.59 1.59 1.52	STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 3220 i: 3200 i: 3220 i: 3200 i:	8 N 1°33.4 E 7°15.0 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.43 0.70 0.00 0.10 0.00 100.00 9 N 1°29.7 E 7°11.2	16 00 SAME 42 43 46 45 2 2
<pre>R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFPH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitams Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis africana Dentex congoensis Sasaroné and Principe 0.05 Lepidotrigla carolae Total</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 catch: 20.79 catch: 20.79	0405 NO: 24 FOS Region Gearc Validi Speed CATCH/F 197.25 17.13 4.98 2.59 1.02 0.94 0.80 0.12 216.52 0405 NO: 24 FOS Region NO: 24 FOS Region CATCH/F	STATION: ITION:Lat Lon i: 3220 i: 3220 i: 3220 i: 3220 i: 3200 i: 3	8 N 1°33.4 E 7°15.0 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.47 0.77 0.06 0.10 0.00 100.00 100.00	16 00 SAME 44 45 2 2 73 11 73
<pre>R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 DATE 13:21:13 13:51:20 DATE 13:21:13 13:51:20 DATE 13:51:21:13:51:20 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitams Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis africana Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis africana Co.05 Lepidotrigla carolae Total</pre>	SURVEY:2011 GEAR TYPE; BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 SURVEY:2010 GEAR TYPE: BT duration 30.2 (min) 1.5 out : 240 m l catch: 20.79	0405 NO: 24 FOS Region Gearc Validi 187.25 17.13 4.98 2.59 1.02 0.94 0.80 0.12 216.52 Validi 0.01 216.52	STATION: ITION:Lat Loon i: 3220 i: 3220 i: 3220 i: 3220 i: 3200 i: 3200 i: 3200 i: 3220 i: 3220 i: 3200 i:	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 1.20 0.47 0.47 0.47 0.47 0.00 0.10 0.00 100.00 9 N 1°29.7 E 7°11.3 kn f TOT. C	SAME 2 44 43 46 45 2 73 11 53AME 4,
<pre>R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 DATE 13:21:13 13:51:20 DATE 13:21:13 13:51:20 FDEPTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis africana Date to congenesis Syacium micrurum Priacanthus arenatus Alloteuthis africana Dentex congenesis Syacium micrurum Priacanthus arenatus Alloteuthis africana Co.05 Lepidotrigla carolae Total</pre>	SURVEY:2011 GEAR TYPE; BT duration 30.1 (min) 1.5 out : 240 m l catch: 108.69 hanolepis hispid GEAR TYPE: BT duration 30.2 (min) 1.5 out : 240 m l catch: 20.79	0405 NO: 24 FOS Region Gearc Validi 187.25 17.13 4.98 2.59 1.02 0.94 0.80 0.12 216.52 216.52 Purpos Region Gearc Validi 107.25 17.13 4.98 0.01 216.52	STATION: ITION:Lat Loon i 3220 cond.: 0 i: 3220 iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 1.20 0.47 0.47 0.47 0.47 0.47 0.47 0.47 0.4	SAME 42 44 43 46 45 2 73 11 53 46 45 2 73 11
<pre>R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 DATE 13:21:13 13:51:20 DATE 13:21:13 13:51:20 FDEPTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitams Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Alloteuthis dificana Cological Start Stop Total</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m hanolepis hispic GEAR TYPE: BT duration 30.2 (min) 1.5 out : 240 m l catch: 20.79	0405 NO: 24 FOS Region Gear c Validi 187.25 17.13 4.98 2.59 1.02 0.94 0.80 0.12 216.52 216.52 0405 NO: 24 FOS Region Gear c Validi 1.02 0.94 0.01 216.52	STATION: ITION:Lat Loon i 3220 cond.: 0 i 3220 i 3320 i 33.0 p hour 216.5 i 3220 i 33.0 p hour 216.5 i 3220 cond.: 0 i 3200 cond.: 0 i 3220 cond.: 0 i 3200 cond.: 0 cond.: 0	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 0.74 0.43 0.74 0.43 0.74 0.43 0.06 0.10 0.00 100.00 100.00 100.00 F TOT. C 44.97 21.40 5 F TOT. C	16 00 SAME 42 43 46 45 2 2 73 11 2 73 11 5AME 42 49 49
<pre>R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 DATE 13:21:13 13:51:20 DATE 13:21:13 13:51:20 FDEFTH: 81 80 Towing dir: 0° Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis Africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Arioma bondi SaG Tomé and Principe 0.03 Lepidotrigla carolae Total R/V Dr. Fridtjof Nansen DATE 12.05.2010 TME 15:71 15:43:06 CHES 94 Towing dir: 0° Wire Sorted : 21 Tota SPECIES Pagellus bellottii Dactylopterus volitans Sphoeroides pachgaster Fistularia petimba Sepia officinalis Caranx crysos Alloteuthis africana Zeus fiber</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69 hanolepis hispic GEAR TYPE: BT duration 30.2 (min) 1.5 out : 240 m 1 catch: 20.79	0405 NO: 24 FOS Purpos Regros Validi 187.25 17.13 4.187.25 17.13 4.259 1.02 0.94 0.10 216.52 NO: 24 FOS NO: 24 FOS NO: 24 FOS Purpos Region Gear c Validi Speed Catch/, Speed	STATION: ITION:Lat Lon i: 3220 cond.: 0 i: 3220 i:	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 0.74 0.75 0.	16 00 SAME 42 43 46 45 2 73 11 SAME 45 45
<pre>R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 DATE 13:21:13 13:51:20 DATE 13:21:13 13:51:20 FDEPTH: 81 80 Towing dir: 0* Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priacanthus arenatus Arioma bondi Sao Tomé and Principe 0.05 Lepidotrigla carolae Total R/V Dr. Fridtjof Nansen DATE 12.05.2010 TIME 15:12:7 15:43:06 DATE 12.05.2010 TIME 15:12:7 15:43:06 TIME 15:12:7 15:43:06 TOME 5:12:7 15:43:06 TIME 15:12:7 15:45 TIME 15:12:7 15:45 TIME 15:12:7 15:45 TIME 15:12:7 15:45 TIME</pre>	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69 hanolepis hispic GEAR TYPE: BT duration 30.2 (min) 1.5 out : 240 m 1 catch: 20.79	0405 NO: 24 FOS Purpos Region Cearc (Validi Speed Catch/ 187.25 17.13 4.93 2.59 1.02 0.94 0.80 0.12 216.52 0.94 0.01 216.52 NO: 24 FOS Region Catch/ 1.59 1.59 1.02 0.94 0.01 216.52 NO: 24 FOS Region Catch/ 8.65 NO: 24 FOS Purpos Region Catch/ 8.65 8.85 8.85 8.85 8.85 8.85 8.85 8.85	STATION: ITION:Lat Lon i 3220 cond.: 0 i 3220 i 3220 i 320 i 33.0 p hour 216.1 i 3220 i 3220 i 14 2 2 5TATION: ITION:Lat ITION:LAT ITION	8 N 1°33.4 E 7°15.6 F TOT. C 86.48 7.91 2.30 1.20 0.74 0.77 1.5 E 7°11.5 E 7°11.5 E 7°12 1.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0	2 5AME 42 44 45 2 73 11 5AME 45 2
 R/V Dr. Fridtjof Nansen DATE 12.05.2010 start stop TIME 13:21:13 13:51:20 LOG : 9744.68 9746.17 FDEFTH: 61 80 Towing dir: 0* Wire Sorted : 109 Tota SPECIES Pagellus bellottii Dactylopterus volitans Pagrus caeruleostictus Alloteuthis africana Fistularia petimba Dentex congoensis Syacium micrurum Priscanthus arenatus Alloteutrigla carolae Total R/V Dr. Fridtjof Nansen DATE :12.05.2010 start stop TOTAI REPTH: 85 94 EDEFTH: 85 94 EDEFTH: 85 94 FDEFTH: 85 94 FDEFTH: 85 94 FDEFTH: 85 94 FDEFTH: 85 94 SPECIES Pagellus bellottii Dactylopterus volitans Sphoeroides pachgaster Fistularia petimba Sepia officinalis Caranx crysos Alloteuthis africana Zeus faber Torpedo torpedo few ap Dentex congoensis Trachinus armatus CORAL 	SURVEY:2011 GEAR TYPE: BT duration 30.1 (min) 1.5 out : 240 m 1 catch: 108.69 hanolepis hispic GEAR TYPE: BT duration 30.2 (min) 1.5 out : 240 m 1 catch: 20.79	0405 NO: 24 FOS Region Gear c Validi 187.25 17.13 4.98 2.59 1.02 0.94 0.01 216.52 0.01 216.52 0.01 216.52 0.01 216.52 0.01 216.52 0.01 216.52 0.01 216.52 0.01 0.01 216.52 0.01 0.01 0.01 216.52	STATION: ITION:Lat Lon i 3200 i 3220 i 3220 i 3200 i 3300 hour 216. i 3220 i 4 i 6 2 2 2 i 4 i 6 2 2 2 i 4 i 6 2 2 2 i 4 i 6 2 2 2 i 4 i 6 2 2 2 i 4 i 6 2 2 2 i 4 i 6 2 2 2 2 2 2 2 2 2 2 2 2 2	8 N 1°33.4 E 7°15.0 % F TOT. C 86.48 7.91 2.30 1.20 0.74 0.75	SAME 42 44 45 2 73 11 53 50

R/V Dr. Fridtjof Nansen SURVEY:20	010405	STATION:	10		R/V Dr.
DATE :12.05.2010 GEAR TYPE: H	BT NO: 24 POS	ITION:Lat	: N 1°26.2	24	DATE :
start stop duration	_	Lor	ь Е 7°17.	99	
TIME :1/:23:40 1/:53:20 29.7 (min)	Purpos	e : 3			TIME :
LOG : 9/68.05 9/69.58 1.5	Region	: 322	20		LOG :
FDEFTH: /6 /1	Gear c	tona.: 0			FDEPTH:
BDEPTH: /6 /1 Tenning dir. 0° Wire out . 205	Validi Coccd	ty : 0	len		BDEPTH:
Towing dir: U Wire out : 205	m speed	: 3.1 heur: 00	0.2		Towing
Softed : 45 Total Catch: 45.4	L Catcil/	nour: 99.	. 92		Sorted
SPECIES	CATCH/H	IOUR %	OF TOT. C	SAMP	SPEC
	weight r	umbers			
SALPS	40.44	0	40.48		Dact
Pagellus bellottii	34.38	233	34.41	51	Page
Dactylopterus volitans	7.08	30	7.08	52	Pagr
Sepia officinalis	5.62	34	5.63	54	Sepi
Fistularia petimba	5.06	10	5.06		Sea
Trachinus armatus	1.15	18	1.15	56	Allo
Zeus faber	0.91	2	0.91		Acan
Raja miraletus	0.87	4	0.87		Fist
Chelidonichthys lastoviza	0.69	18	0.69		Torp
Dentex congoensis	0.69	24	0.69	55	Chil
Uranoscopus polli	0.63	4	0.63		Dent
Trachinus radiatus	0.61	2	0.61		CARA
Pseudupeneus prayensis	0.61	6	0.61	53	
Decapterus macarellus	0.49	8	0.49		Tota
Trachinocephalus myops	0.30	2	0.30		
Alloteutnis alričana	0.20	61	0.20		
riiacantnus arenatus	0.20	2	0.20		
Total	99.92		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2010	405 STATION: 11
DATE :12.05.2010 GEAR TYPE: PT	NO: 7 POSITION:Lat N 1°28.88
start stop duration	Lon E 7°7.77
TIME :20:09:30 21:10:46 61.3 (min)	Purpose : 1
LOG : 9786.14 9789.57 3.4	Region : 3220
FDEPTH: 10 10	Gear cond.: 0
BDEPTH: 373 466	Validity : 0
Towing dir: 0° Wire out : 180 m	Speed : 3.4 kn
Sorted : 2 Total catch: 1.88	Catch/hour: 1.84
SPECIES	CATCH/HOUR % OF TOT. C SAMP
	weight numbers
Cubiceps pauciradiatus	1.24 43 67.48
Hirundichthys affinis	0.16 1 8.50
Illex coindetii	0.12 3 6.38
Neolates tripes	0.12 6 6.38
Todaropsis eblanae	0.11 2 5.84
MYCTOPHIDAE	0.05 41 2.66
SYNODONTIDAE	0.02 36 1.06
Leptocephalus	0.01 5 0.80
BOTHIDAE, juvenile	0.01 22 0.58
ISOPODS	0.00 3 0.16
APOGONIDAE, juvenile	0.00 6 0.16
	1.84
IUCAL	1.01 100.00

R/V Dr. Fridtiof Nansen	SURVEY:2	010405	STATION:	12	
DATE :13.05.2010	GEAR TYPE:	BT NO: 24	POSTTION: La	+ N 1°37.1	4
start stop d	uration		Los	5 E 7°20 8	18
TIME :06:56:54 07:27:24 3	0.5 (min)	Pur	pose : 3		-
LOG : 9830.79 9832.31	1.5	Reg	ion : 32	20	
FDEPTH: 38 47		Gea	r cond.: 0		
BDEPTH: 38 47		Val	idity : 0		
Towing dir: 0° Wire o	ut : 120	m Spe	ed : 3.1) kn	
Sorted : 186 Total	catch: 186.	05 Cat	ch/hour: 36	6.00	
SPECIES		CATC	H/HOUR %	OF TOT. C	SAMP
		weight	numbers		
Drepane africana		210.49	366	57.51	57
Dactylopterus volitans		114.10	479	31.17	58
Albula vulpes		14.56	18	3.98	60
CARANGIDAE		8.85	6	2.42	61
Balistes capriscus		6.30	10	1.72	
Acanthostrascion guineen	sis	4.52	22	1.24	
Lutjanus goreensis		2.64	2	0.72	62
Alectis alexandrinus		2.62	2	0.71	59
Carangoides bartholomaei		1.38	2	0.38	
Bothus guibei		0.31	2	0.09	
Pagellus bellottii		0.18	2	0.05	
Pagrus caeruleostictus		0.06	2	0.02	
Total		366.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2	010405	STATION:	13	
DATE :13.05.2010 GEAR TYPE:	BT NO: 24 PO	SITION:Lat	N 1°26.3	81
TIME :13:34:59 14:05:31 30.5 (min)	Purpo	se : 3	5 / 20.0	/±
LOG : 9872.32 9873.89 1.6	Regio	n : 322	0	
FDEPTH: 84 88	Gear	cond.: 0		
BDEPTH: 84 88	Valid	ity : 0		
Towing dir: 0° Wire out : 230	m Speed	: 3.1	kn	
Sorted : 30 Total catch: 29.6	5 Catch	/hour: 58.	26	
SPECIES	CATCH/	HOUR %	OF TOT. C	SAMP
	weight	numbers		
Pagellus bellottii	21.02	102	36.09	63
Pagrus caeruleostictus	15.72	14	26.98	64
Dactylopterus volitans	9.04	37	15.51	65
Alloteuthis africana	5.21	1847	8.94	
Fistularia petimba	4.22	12	7.25	
Sepia officinalis	1.96	22	3.37	66
Chilomycterus spinosus mauret.	0.57	2	0.98	
Zeus faber	0.39	4	0.67	
Dentex congoensis	0.08	4	0.13	
Carapus acus	0.04	2	0.07	
Ariomma bondi	0.00	2	0.01	
Sea cucumber (bread like)	0.00	2	0.00	
Total	58.26		100.00	

	R/V Dr. Fridtjof Nansen SURVEY:20104 DATE :13.05.2010 GEAR TYPE: ET N start stop duration TIME :15:26:09 15:56:51 30.7 (min) LOG :9883.13 9804.49 1.4 FDEFTH: 63 65 BDEFTH: 63 65 Towing dir: 0" Wire out : 165 m Sorted : 170 Total catch: 169.79	05 STATION: C: 24 POSITION:Lat Purpose : 3 Region : 32C Gear cond.: 0 Validity : 0 Speed : 2.7 Catch/hour: 331.	14 № 1°30.32 E 7°18.69 kn 84
SAMP	SPECIES	CATCH/HOUR % C	F TOT. C SAMP
51 52 54 56	Dactylopterus volitans Pagellus bellottii Pagrus caeruleostictus Sepia officinalis Sea cucumber Alloteuthis africana Acanthostrascion guineensis	Weight Humbers 310.75 1661 7.82 35 5.08 20 1.47 12 1.43 2 1.37 328 1.37 4	93.65 68 2.36 69 1.53 70 0.44 71 0.43 0.41 0.41
55	Fistularia petimba Torpedo torpedo Chilomycterus spinosus mauret. Dentex congoensis	0.90 2 0.88 2 0.51 2 0.23 8	0.27 0.27 0.15 0.07 72
53	CARAPIDAE — — — — — — — — — — — — — — — — — — —	0.04 2 331.84	0.01
	R/V Dr. Fridtjof Nansen SURVEY:20104 DATE :13.05.2010 GEAR TYFE: PT N start stop duration TIME :148:41 19:36:59 46.2 (min) LOG : 9999.60 9901.36 2.8 FDEPTH: 671 1087 Towing dir: 0* Wire out : 120 m Sorted : 29 Total catch: 29.12	05 STATION: c: 5 POSITION:Lat Purpose 1 Region : 3220 Gear cond: 0 Validity : 0 Speed : 3.4 Catch/hour : 36.2	15 N 1°17.00 E 7°13.66 kn 6
SAMP	SPECIES Ommastrephes bartrami Myctophidae sp. small/mix SALPS Myctophidae sp. large Cubiceps pauciradiatus Neolates tripes Cypselurus cyanopterus	CATCH/HOUR % C weight numbers 21.79 189 4.71 5883 4.02 0 1.72 515 1.69 463 1.12 40 0.93 45 0.27 1	00 TOT. C SAMP 00.10 73 12.98 11.09 4.74 4.67 3.09 2.58 0.76
	R/V Dr. Fridtjof Nansen SURVEY:20104 DATE :14.05.2010 GEAR TYPE: FT N start stop duration TIME :18:53:30 19:37:13 43.7 (min) LOG : 19:48 22.23 2.8 DEPETH: 0 0 BDEPTH: 598 579 Towing dir: 0* Wire out : 120 m Sorted : 1 Total catch: 1.38 SPECIES Ommastrephes bartrami Sardinella maderensis Euthynnus alletteratus, juvenile MYCTOPHIDAE Mullidae juvenile	05 STATION: 0: 5 POSITION:Lat Lon Purpose : 1 Region : 321 Gear cond.: 8 Validity : 4 Speed : 3.8 CATCH/HOUR % C weight numbers 1.59 21 0.23 43 0.03 1 0.03 1 0.03 27 0.01 1	16 N 0°18.07 E 6°27.85 Kn F TOT. C SAMP 84.06 74 12.32 75 1.45 1.45 0.72
57 58 60 61	Total	1.89	100.00
62 59	R/V Dr. Fridtjof Nansen SURVEY:20104 DATE :15.05.2010 GEAR TYPE: FY N start stop duration TIME :00:50:37 01:20:40 30.1 (min) LOG : 33.15 34.62 1.5 FDEFTH: 0 EDEFTH: 0 EDEFTH: 126 100 Towing dir: 0* Wire out :140 m Sorted : 9 Total catch: 9.49	05 STATION: 0: 4 POSITION:Lat Lon Purpose : 1 Region : 3210 Gear cond.: 0 Validity : 0 Speed : 2.9 Catch/hour: 18.5	17 N 0°7.12 E 6°25.07 kn 4
53MP 63 64 65 66	SPECIES DASYATIDAE Myctophidae sp. small/mix Myctophidae sp. large Nesiarchus nasutus NOTACANTHIDAE Small squids Leptocephalus Cubiceps pauciradiatus Cryptoparas couesii Eumecichthys fiski Euphausiacea Taractichthys of steindacneri, juvenile Howella sp. Cubiceps sp. Maurolicus muelleri Promethichthys prometheus Myctophidae sp. slender PARALEPIDIDAE Nemichthys curvirostris BALISTIDAE, juvenile Nelates tripes Phyllosoma BDIHIDAE, juvenile Diplophoa sp. MAIACOSTEIDAE	CATCH/HOUR % C weight numbers 13.18 2 2.76 2755 0.90 84 0.70 200 84 0.44 148 0.40 0 0.22 16 0.04 2 0.02 20 0.03 2 0.00 2 0.00 2 0.01 2 0.00 2 0.01 2 0.01 2 0.00 2	F TOT. C SAMP 69.58 14.55 14.55 2.32 2.11 1.16 0.79 0.15 0.13 0.11 0.07 0.07 0.06 0.05 0.05 0.05 0.01 0.00 0.01 0.01 0.01 0.00 0.00 0.01 0.01 0.00 0.00 0.01 0.00 0.00 0.00 0.01 0.00

Total 18.94

100.00

R/V Dr. Fridtjof Nansen	SURVEY:201	0405	STATION:	18	
DATE :15.05.2010	GEAR TYPE: BT	NO: 24 H	POSITION:Lat	N 0°8.49)
start stop	duration		Lon	E 6°28.0	16
TIME :06:45:26 07:06:13	20.8 (min)	Purt	ose : 3		
LOG : 52.51 53.57	1.1	Regi	on : 321	0	
FDEPTH: 71 75		Gear	cond.: 0		
BDEPTH: 71 75		Vali	dity : 0		
Towing dir: 0° Wire	out : 175 m	Spee	ed : 3.1	kn	
Sorted : 67 Total	catch: 67.14	Cato	ch/hour: 193	.95	
CDECTEC		C3.001	1/1101ID %		CAMD
SFECIES		CAICI	numbers	JF 101. C	SAME
Desellus bellettii		100 22	760	EE 0E	76
Priacanthus arenatus		19 04	66	9.82	81
Lutianus fulgens		14 47	38	7 46	79
Pseudupeneus pravensis		11.01	95	5.67	82
Dentex canariensis		7.28	3	3.75	83
Fistularia petimba		7.08	17	3.65	
Paranthias furcifer		7.08	38	3.65	77
Pagrus caeruleostictus		6.18	9	3.19	80
Dactylopterus volitans		5.06	23	2.61	78
Zeus faber		2.05	3	1.06	
Seriola carpenteri		1.73	9	0.89	
Chaetodon marcellae		1.47	3	0.76	
Selar crumenophthalmus		0.90	3	0.46	
Diodon holocanthus		0.64	3	0.33	
Anthias anthias		0.58	6	0.30	
Alloteuthis africana		0.52	107	0.27	
Sepia officinalis		0.26	6	0.13	
Dentex congoensis		0.26	12	0.13	
Apogon sp.		0.03	3	0.01	
Total	-	193.95		100.00	

R/V Dr. Fridtjof Nansen	SURVEY:201	0405	STATION:	19	
DATE :15.05.2010 G	EAR TYPE: BT	NO: 24	POSITION:Lat	N 0°5.60	D
start stop du	ration		Lon	E 6°29.'	79
TIME :08:49:42 09:08:15 18	.6 (min)	Pur	pose : 3		
LOG : 63.56 64.46 0	.9	Reg	ion : 321	0	
FDEPTH: 42 47		Gea	r cond.: 0		
BDEPTH: 42 47		Val	idity : 0		
Towing dir: 0° Wire ou	t : 120 m	Spe	ed : 2.9	kn	
Sorted : 77 Total c	atch: 77.32	Cat	ch/hour: 250	.10	
SPECIES		CATC	H/HOUR %	OF TOT. C	SAMP
		weight	numbers		
Dactylopterus volitans		161.73	1271	64.66	84
Pagellus bellottii		37.36	220	14.94	85
Balistes capriscus		13.84	23	5.54	
Lethrinus atlanticus		11.81	23	4.72	87
Pagrus caeruleostictus		11.32	58	4.53	86
Alloteuthis africana		3.65	1514	1.46	
Pseudupeneus prayensis		2.78	23	1.11	88
Balistes punctatus		1.84	3	0.74	
Octopus vulgaris		1.46	3	0.58	
Sepia officinalis		1.39	6	0.56	89
Seriola carpenteri		1.36	6	0.54	
Chelidonichthys gabonensi	s	0.61	3	0.25	
Fistularia petimba		0.58	3	0.23	
Starfish		0.23	3	0.09	
Syacium micrurum		0.06	3	0.03	
Grammoplites gruveli		0.03	3	0.01	
Decapterus punctatus		0.03	3	0.01	
Brachydeuterus auritus		0.01	3	0.00	
Total	-	250.10		100.00	

R/V Dr. Fridtjof Nansen	SURVEY:20	010405	STATIC	DN: 20	
DATE :15.05.2010 G	EAR TYPE: H	BT NO: 24	POSITION:	Lat N 0°1	L.14
start stop du	ration			Lon E 6°2	29.64
TIME :11:44:35 12:15:25 30	.8 (min)	Pi	irpose :	3	
LOG : 74.90 76.44 1	.5	Re	egion :	3210	
FDEPTH: 82 56		Ge	ear cond.:	0	
BDEPTH: 82 56		Va	alidity :	0	
Towing dir: 0° Wire ou	t : 180	m Sj	beed :	3.0 kn	
Sorted : 203 Total c	atch: 203.2	21 Ca	atch/hour:	395.35	
SPECTES		C.N.		% OF TOT	C CAMD
SFECIES		CA.	number	5 OF 101.	C SAMP
Destandent sources and there a		weign	. numbers		
Dactylopterus volitans		182.0	58 1604 70 611	40.20	2 161
Decapterus macarerrus		114.	19 011	L 25.0.	160
Capia officinalia		17	20 61	2 11.01	162
Deisseethus seesstus		12	52 61	2 4.50	1 165
Chilemusterus enirosus ma		13.	02 02	1 0/	1 TOJ
Childenycterus spinosus ma	uret.		DI 3.		- 166
Pseudupeneus prayensis		2.1	14 11	0.7	, TOO
Syacium micrurum		3.1	2 2	0.76	1.60
Epinepheius aeneus		2	22	0.3	2 100
Zeus Iaber		1.1	50 4	2 0.4	/
Alucerus neudelocii		1	12 1	0.5	2
Acanchoscrascion guineens	12	1.	24	1 0.50	
Color onumerorhtholmus		0.0	1 2	0.2	2
Seriele composteri		0	11 2	0.1	>
Serioia carpenteri Cheliderichthus schererei	~	0.4	11 2 21 7	0.10	2
Cherraohichthys gabonensi	5	0	D1 4	- 0.00	2
Arnogiossus imperialis		0.	14 11	5 U.U.	3
Dentex congoensis		0.	10 10	0.02	2 16/
cicharus ilnguatula		0.0	14 4	. 0.00	,
Total		395.	35	100.00	5

R/V Dr. Fridtjof Nansen SURVEY:201 DATE 15.05.2010 GEAR TYPE: B start stop duration TIME :13:53:16 14:24:51 31.6 (min) LOG LOG e5.52 87.30 FDEPTH: 25 25 S FDerpH: 25 25 Towing dir: 0" Wire out : 130 m Sorted : 301 Total catch: 301.11	0405 NO: 24 POS Region Gear c Validi Speed Catch/	STATION: ITION:Lat Lon 2 : 3 : 321 ond.: 0 ty : 0 : 3.4 nour: 571	21 N 0°0.30 E 6°30.3 0 kn .90	16
SPECIES	CATCH/H	JUR %	OF TOT. C	SAMP
	weight n	umbers		
Dactylopterus volitans	254.51	2376	44.50	92
Cheionia mydas	132.95	4	23.25	
Sphyraena sphyraena	56.98	211	9.96	93
Lagocephaius lagocephaius DEAD	41.79	84	7.31	
Acanthostrascion guineensis	18.23	140	3.19	07
Jecapterus punctatus	13.90	140	2.44	97
Delictee pupetetue	7 70	20	1 26	93
Deceptorue macarollue	7 31	40	1 29	96
Copio officipalia	6.46	21	1 1 2	90
Bothue guibai	6 17	20	1.15	90
Bagallus ballattii	5 99	32	1 03	9/
Diodon bolocanthus	2 01	2	0.35	23
Aluterus beudelotii	1 92	6	0.33	
Chilomyctoryc epinocyc maurot	1.92	17	0.33	
Fietularia tabacaria	1 23	1	0.35	
Stenhanolenis hisnidus	0.89	8	0.16	
Recuduponque prayoneie	0.76	6	0.13	0.0
Carapy crusos	0.66	2	0.12	
Scorpaena notata	0.65	4	0.11	
Pagrus caeruleostictus	0.40	6	0.07	1.00
Yurichtys novacula	0.23	2	0.04	100
Exodromidia sp	0.23	6	0 04	
Aulostomus strigosus	0.21	2	0.04	
Sphoeroides marmoratus	0.19	4	0.03	
Torpedo torpedo	0.19	2	0.03	
Bothus podas africanus	0.06	2	0.01	
Serranus sp. Heemstra	0.01	2	0.00	
Total	571.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:20	10405 STATION: 22	
DATE :15.05.2010 GEAR TYPE: F	T NO: 24 POSITION:Lat N 0°2.66	
start stop duration	Lon E 6°34.96	
TIME :16:22:53 16:49:39 26.8 (min)	Purpose : 3	
LOG : 101.10 102.50 1.4	Region : 3210	
FDEPTH: 62 75	Gear cond.: 0	
BDEPTH: 62 75	Validity : 0	
Towing dir: 0° Wire out : 170	m Speed : 3.1 kn	
Sorted : 52 Total catch: 51.54	Catch/hour: 115.52	
SPECIES	CATCH/HOUR % OF TOT. C SAM	Ρ
	weight numbers	
Pagellus bellottii	35.41 262 30.66 10	2
Galeoides decadactylus	33.06 90 28.62 10	1
Fistularia petimba	11.77 40 10.19	
Pagrus caeruleostictus	5.16 20 4.46 10	7
Sphyraena sphyraena	4.59 9 3.98 10	8
Scorpaena stephanica	3.36 4 2.91	
Dentex congoensis	3.25 121 2.81 10	6
Decapterus macarellus	2.47 25 2.13	
Pomadasys incisus	2.24 16 1.94 10	4
Psettodes belcheri	1.99 2 1.73	
Dactylopterus volitans	1.61 16 1.40	
Pseudupeneus prayensis	1.57 13 1.36 10	3
Decapterus punctatus	1.39 108 1.20 10	5
Sphyraena guachancho	1.37 2 1.18	
Sepia officinalis	1.26 2 1.09	
Syacium micrurum	1.03 13 0.89	
Priacanthus arenatus	1.01 4 0.87	
Lagocephalus laevigatus	0.99 2 0.85	
Selene dorsalis	0.69 2 0.60	
Citharus linguatula	0.52 9 0.45	
Chilomycterus spinosus mauret.	0.29 2 0.25	
Brotula barbata	0.20 2 0.17	
Grammoplites gruveli	0.13 2 0.12	
GOBIIDAE	0.11 27 0.10	
Brachydeuterus auritus	0.02 13 0.02	
Saurida brasiliensis	0.02 9 0.02	
mate al	115 50 100 00	
TOTAL	115.52 100.00	

R/V Dr. Fridtjof Nansen SURVEY:20 DATE :15.05.2010 GEAR TYPE: B start stop duration	10405 STATION T NO: 24 POSITION:La	23 at N 0°4.35 on E 6°38.7	7
TIME :18:01:32 18:23:34 22.0 (min) LOG : 109.90 111.05 1.2 FDEPTH: 56 60	Purpose : 2 Region : 33 Gear cond.: 0	210	
BDEPTH: 56 60	Validity : 0		
Towing dir: U Wire out : 150 :	m Speed : 3	.⊥ kn	
Sorted : 112 Total catch: 111.9	/ Catch/hour: 30	14.82	
SPECIES	CATCH/HOUR	OF TOT. C	SAMP
	weight numbers		
Pagrus caeruleostictus	91.20 112	29.92	110
Galeoides decadactylus	59.89 192	19.65	109
Dactylopterus volitans	32.67 155	10.72	111
Priacanthus arenatus	24.50 106	8.04	112
Pagellus bellottii	22.73 370	7.46	114
Lutjanus fulgens	15.65 46	5.14	113
Albula vulpes	15.52 22	5.09	115
Pomadasys incisus	11.30 93	3.71	117
Pomadasys rogeri	9.39 11	3.08	116
Syacium micrurum	5.44 147	1.79	
Sepia officinalis	4.33 11	1.42	121
Echelus myrus	3.27 3	1.07	
Pseudupeneus prayensis	2.89 60	0.95	118
Fistularia petimba	1.63 5	0.54	
Balistes capriscus	1.55 3	0.51	
Epinephelus goreensis	0.84 8	0.28	119
Decapterus punctatus	0.65 38	0.21	120
Rypticus saponaceus	0.49 3	0.16	
Torpedo torpedo	0.25 3	0.08	
Calappa rubroguttata	0.19 3	0.06	
Chilomycterus spinosus mauret.	0.16 3	0.05	
Penaeus notialis	0.16 5	0.05	
Saurida brasiliensis	0.08 33	0.03	
Brachydeuterus auritus	0.03 8	0.01	
Total	304.82	100.00	

R/V Dr. Fridtjof Nansen	SURVEY:20	10405		STATION:	24	
DATE :15.05.2010	GEAR TYPE: P	T NO:	4 POS	ITION:Lat	: S 0°1.50)
start stop	duration			Lor	ь E 6°34.3	L5
TIME :19:56:36 20:47:23	50.8 (min)		Purpose	e : 1		
LOG : 118.38 121.24	2.9		Region	: 321	0	
FDEPTH: 0 0			Gear co	ond.: 0		
BDEPTH: 812 1071			Validi	ty : 0		
Towing dir: 0° Wire	out : 70	m	Speed	: 3.4	l kn	
Sorted : 15 Total	catch: 15.20		Catch/l	nour: 17.	96	
SPECIES		C	CATCH/H	DUR %	OF TOT. C	SAMP
		weig	ght n	umbers		
SALPS		7	1.92	0	44.08	
Selar crumenophthalmus		4	1.41	17	24.54	122
Myctophidae sp. small/m	ix	2	2.40	0	13.36	
Myctophidae sp. large		(0.93	299	5.20	
Albula vulpes		(.70	1	3.88	
Neolates tripes		(.56	25	3.09	
Priacanthus arenatus		().32	2	1.78	
CRANCHIIDAE		(.20	7	1.12	
Synagrops sp.		(0.17	7	0.92	
Ommastrephes bartrami		(0.17	2	0.92	
Syacium micrurum		(0.07	2	0.39	
NOTACANTHIDAE		(0.07	11	0.39	
Acistroteuthis-like no	hooks	(0.05	5	0.26	
Cranchia sp.		(0.01	1	0.07	
Total			1.96		100.00	

					Trachinus ar Arnoglossus Maja sp. Lepidotrigla
					Total
R/V Dr. Fridtjof Nansen SURV	EY:2010405	STATION:	25		
DATE :16.05.2010 GEAR TY	PE: BT NO: 24 POS	SITION:Lat	N 0°4.5	4	
start stop duration	L	Lon	ь Е 6°39.	19	
TIME :12:53:43 13:23:52 30.1 (mi	n) Purpo:	se : 3			
LOG : 180.39 181.93 1.6	Regio	1 : 321	.0		
FDEPTH: 62 60	Gear	cond.: 0			
BDEPTH: 62 60	Valid	ity : 0			
Towing dir: 0" Wire out :	200 m Speed	: 3.1	. kn		
Sorted : 217 Total catch:	216.92 Catch,	nour: 431	.82		R/V Dr. Fridtjo
2002202	01 more (1				DATE :17.05.20
SPECIES	CATCH/1	100R %	OF TOT. C	SAMP	Start
The second second second second	weight i	lumbers	20.07	100	TIME :05:13:20
Pomadasys incisus	139.35	1440	32.27	123	LUG : 257.20
Dactytopterus voritans	35.72	207	10.00	123	PDEPIN: 000
Pagerius beriottii	27.60	257	0.37	1.21	BDEFIN: 201
Lutianue fulgone	35 24	66	9.16	124	Sorted . 3
Doptoy conscience	27 47	29	6 36	129	301ted . 2
Pagrus caeruleostictus	19 91	113	4 61	128	SPECTES
Pseudupeneus pravensis	14 53	213	3 37	126	01101100
Sepia officinalis	9.56	16	2.21	132	Lagocephalus
Fistularia petimba	9.56	30	2.21		Fistularia s
Galeoides decadactylus	4.08	8	0.95	130	Apsilus fusc
Dentex congoensis	3.92	189	0.91	133	Selene dorsa
Svacium micrurum	3.46	46	0.80		Alloteuthis
Pagrus africanus	3.42	2	0.79	136	Tetradontida
Psettodes belcheri	3.40	4	0.79	134	Abraliopsis
Octopus vulgaris	3.34	6	0.77		Acanthurus m
Selene dorsalis	3.32	16	0.77	135	
Aluterus heudelotii	1.81	4	0.42		Total
Citharus linguatula	1.77	54	0.41		
Caranx crysos	1.55	2	0.36		
Balistes capriscus	1.07	2	0.25		
Rypticus saponaceus	1.06	6	0.24		
Chilomycterus spinosus mauret.	0.52	4	0.12		
Grammoplites gruveli	0.46	8	0.11		
Antennarius cf pardalis	0.34	2	0.08		
Sardinella aurita	0.24	2	0.06		
Penaeus notialis	0.15	6	0.03		R/V Dr. Fridtjo
Brachydeuterus auritus	0.14	20	0.03		DATE :18.05.20
GOBIIDAE	0.01	2	0.00		start
					TIME :12:16:42
Total	431.82		100.00		LOG : 299.08

R/V Dr. Fridtjof Nansen SURVEY:20	010405	STATION:	26	
DATE :16.05.2010 GEAR TYPE: 1	BT NO: 24 PO	SITION:Lat	N 0°8.46	5
start stop duration		Lon	E 6°41.4	12
TIME :15:15:48 15:36:01 20.2 (min)	Purpo	se : 3		
LOG : 194.27 195.29 1.0	Regio	n : 321	0	
FDEPTH: 54 61	Gear	cond. t 0		
BDEPTH: 54 61	Valid	itv : 0		
Towing dir: 0° Wire out : 180	m Sneed	. 3 0	kn	
Sorted : 440 Total catch: 439	72 Catch	/hour: 130	4 81	
SPECIES	CATCH/	HOUR %	OF TOT. C	SAMP
	weight	numbers		
Lutianus fulgens	694 36	1688	53 22	138
Galeoides decadactvlus	163.20	439	12.51	142
Acanthurus monroviae	124.63	151	9.55	144
Dactylopterus volitans	74 18	371	5 69	1.41
Dentex canariensis	42.14	30	3.23	146
Paranthias furcifer	39.17	154	3.00	143
Apsilus fuscus	39.17	62	3.00	140
Pagellus bellottii	31.01	139	2.38	147
Sepia officinalis	18.40	45	1.41	152
Pagrus caeruleostictus	13.35	45	1.02	145
Carangoides bartholomaei	12.61	6	0.97	148
Lutjanus goreensis	7.86	3	0.60	139
Svacium micrurum	6.85	74	0.53	
Pseudupeneus pravensis	5.93	68	0.45	149
Fistularia petimba	5.79	1.8	0.44	
Psettodes belcheri	4.48	9	0.34	150
Selene dorsalis	3.68	15	0.28	151
Seriola carpenteri	3.29	3	0.25	
Pomadasys rogeri	3.23	3	0.25	
Lethrinus atlanticus	2.49	3	0.19	
Sphyraena sphyraena	2.14	6	0.16	
Torpedo torpedo	2.14	9	0.16	
Citharus linguatula	1.69	47	0.13	
Chilomycterus spinosus mauret.	1.28	6	0.10	
Chaetodon hoefleri	0.74	6	0.06	
Calappa rubroguttata	0.33	3	0.03	
Microchirus frechkopi	0.14	3	0.01	
Canthigaster rostrata	0.10	3	0.01	
Muraena melanotis	0.09	3	0.01	
Serranus accraensis	0.09	3	0.01	
Cronius ruber	0.06	3	0.00	
Dentex congoensis	0.06	9	0.00	
'Mole crab	0.03	3	0.00	
Grammoplites gruveli	0.03	3	0.00	
Saurida brasiliensis	0.01	3	0.00	
Hermits, mixed	0.01	3	0.00	
Total	1304.78		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2	010405	STATION:	27	
DATE :16.05.2010 GEAR TYPE:	BT NO: 24 PC	SITION:Lat	N 0°15.5	3
start stop duration		Lon	E 6°47.0	9
TIME :17:28:21 17:59:01 30.7 (min)	Purpo	ose : 3		
LOG : 208.77 210.24 1.5	Regio	on : 3210	C	
FDEPTH: 64 70	Gear	cond.: 0		
BDEPTH: 64 70	Valio	dity : 0		
Towing dir: 0° Wire out : 165	m Speed	1 : 2.9	kn	
Sorted : 221 Total catch: 220.	79 Catch	n/hour: 431	.92	
SPECIES	CATCH	HOUR %	DF TOT. C	SAMP
	weight	numbers		
Dactylopterus volitans	264.10	2031	61.15	153
Pagellus bellottii	111.51	730	25.82	154
Sepia officinalis	21.52	74	4.98	158
Fistularia petimba	9.98	33	2.31	
Pseudupeneus prayensis	5.28	67	1.22	156
Decapterus punctatus	4.79	200	1.11	160
Sphyraena sphyraena	4.11	12	0.95	157
Dentex congoensis	3.25	192	0.75	159
Syacium micrurum	2.64	18	0.61	
Apsilus fuscus	1.17	2	0.27	
Pomadasys incisus	1.04	6	0.24	
Chilomycterus spinosus mauret.	0.82	6	0.19	
Trachinus radiatus	0.51	2	0.12	
Ariosoma sp.	0.35	4	0.08	
Uranoscopus polli	0.29	2	0.07	
Calappa rubroguttata	0.22	2	0.05	
Sardinella aurita	0.16	4	0.04	
Trachinus armatus	0.12	2	0.03	
Arnoglossus imperialis	0.04	6	0.01	
Maja sp.	0.02	2	0.00	
Lepidotrigla carolae	0.01	2	0.00	
Total	431.92		100.00	

R/V Dr. Fridtjof Nansen	SURVEY:201	0405	STATION:	28	
DATE :17.05.2010	GEAR TYPE: PT	NO: 4 P	OSITION:Lat	N 0°5.05	
start stop	duration		Lon	E 6°40.7	3
TIME :05:13:20 06:00:15	46.9 (min)	Purp	ose : 1		
LOG : 257.26 259.76	2.5	Regi	on : 3210		
FDEPTH: 0 0		Gear	cond.: 0		
BDEPTH: 287 369		Vali	dity : 0		
Towing dir: 0° Wire	out : 110 m	Spee	d : 3.2	kn	
Sorted : 2 Tota	l catch: 1.59	Catc	h/hour: 2.03		
SPECIES		CATCH	/HOUR % O	F TOT. C	SAME
		weight	numbers		
Lagocephalus lagocepha	lus DEAD	1.99	5	98.30	
Fistularia sp., juveni	le	0.01	5	0.63	
Apsilus fuscus, juveni	le	0.01	4	0.38	
Selene dorsalis, juven	ile	0.01	15	0.25	
Alloteuthis africana		0.00	1	0.19	
Tetradontidae - juveni	le	0.00	1	0.13	
Abraliopsis sp.		0.00	1	0.06	
Acanthurus monroviae,	juvenile	0.00	1	0.06	
	_		_		
Total		2.03		100.00	

R/V Dr. Fridtjof Nansen	SURVEY:201	0405	STATION:	29	
DATE :18.05.2010	GEAR TYPE: BT	NO: 24 H	POSITION:La	t N 0°15.	52
start stop	duration		Lo	n E 6°47.	10
TIME :12:16:42 12:47:03	30.4 (min)	Purp	oose : 2		
LOG : 299.08 300.54	1.5	Regi	lon : 32	10	
FDEPTH: 63 69		Gear	cond.: 0		
BDEPTH: 63 69		Vali	idity : 0		
Towing dir: 0° Wire	out : 180 m	1 Spee	ed : 2.	9 kn	
Sorted : 343 Total	catch: 343.47	Cato	ch/hour: 67	8.79	
SPECIES		CATCH	H/HOUR %	OF TOT. C	SAMP
		weight	numbers		
Dactylopterus volitans		318.18	2217	46.87	169
Pagellus bellottii		233.20	947	34.36	170
Fistularia petimba		55.34	221	8.15	
Sepia officinalis		21.15	59	3.12	174
Pagrus caeruleostictus		14.62	10	2.15	171
Pseudupeneus prayensis		9.70	119	1.43	177
Lutjanus fulgens		6.32	10	0.93	173
Dentex canariensis		4.64	4	0.68	172
Dentex congoensis		2.96	198	0.44	175
Epinephelus aeneus		2.00	2	0.29	176
Alloteuthis africana		1.98	1132	0.29	
Syacium micrurum		1.82	8	0.27	
Octopus vulgaris		1.78	2	0.26	
Chilomycterus spinosus :	mauret.	1.56	10	0.23	
Apsilus fuscus		1.19	2	0.17	
Seriola carpenteri		0.95	4	0.14	
Selar crumenophthalmus		0.71	2	0.10	
Aluterus heudelotii		0.57	2	0.08	
Decapterus punctatus		0.12	2	0.02	
Total	-	678.79		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2 DATE :18.05.2010 GEAR TYPE:	010405 BT NO: 24 POS	STATION: SITION:Lat	30 N 0°8.7	4	R/V Dr. Fridtjof Nam DATE :18.05.2010
start stop duration		Lor	ь Е 6°41.	65	start st
FIME :14:10:06 14:40:22 30.3 (min)	Purpos	se : 2			TIME :19:05:35 19:3
LOG : 309.37 310.97 1.6	Regior	n : 321	.0		LOG : 331.06 33
FDEPTH: 57 65	Gear d	cond.: 0			FDEPTH: 65
3DEPTH: 57 65	Valid:	ty : 0			BDEPTH: 65
Fowing dir: 0° Wire out : 175	m Speed	: 3.2	kn		Towing dir: 0°
Sorted : 138 Total catch: 138.	46 Catch/	'hour: 274	.54		Sorted : 232
SPECIES	CATCH/H	IOUR %	OF TOT. C	SAMP	SPECIES
Calcoider decadactulur	00 1/	276	36 11	179	Physicalus of hu
Bagellue bellettii	32.14	133	11 77	1 9 1	Physiculus CI nu.
Pageilus beliottii	32.32	100	10.76	101	Calasidas desedas
Diepalle all'iCalla Demodocuo record	10 64	20	6 70	104	Brenethichthus n
Pomadasys rogeri Bretule berbete	15.64	20	6.75	104	Prometnichtnys pi
Biocula DalDala	10.10		J./1	170	Dactyropterus vo.
Pomadasys incisus	12.10	93	4.41	1/9	Syacium micrurum
Dactylopterus volitans	10.51	59	3.83	183	Boops boops
Pagrus caeruleostictus	9.22	87	3.30	180	Pomadasys rogeri
Sepia officinalis	1.53	12	2.74	186	MYCTOPHIDAE
Syacium micrurum	6.36	83	2.32		Pomadasys incisus
Citharus linguatula	4.22	198	1.54		Pseudupeneus pray
Psettodes belcheri	4.14	8	1.51	189	Pagrus caeruleos
Aluterus monoceros	3.91	2	1.42		Sepia officinali:
Pseudupeneus prayensis	3.85	54	1.40	188	Fistularia petimb
Selene dorsalis	2.88	14	1.05	190	Pseudotolithus se
Epinephelus aeneus	2.16	2	0.79	187	Lesueurigobius s
Chelidonichthys gabonensis	1.55	6	0.56		Dentex congoensis
Lutjanus fulgens	1.49	2	0.54		Citharus linguatu
Octopus vulgaris	1.13	2	0.41		Chilomycterus sp:
Aluterus heudelotii	1.03	2	0.38		Psettodes belcher
Pseudotolithus senegalensis	1.03	2	0.38		CONGRIDAE
Lagocephalus lagocephalus DEAD	0.99	2	0.36		Octopus vulgaris
Calappa pelii	0.87	12	0.32		Torpedo 5 very we
Sardinella maderensis	0.81	4	0.30		Priacanthus arena
Brachydeuterus auritus	0.67	220	0.25		Aluterus heudelot
Lesueurigobius sp.	0.54	135	0.20		Chilomycterus sp:
Grammoplites gruveli	0.44	10	0.16		Sardinella madere
Dentex congoensis	0.28	22	0.10		Seriola carpenter
CONGRIDAE	0.26	6	0.09		NETTASTOMATIDAE
Chilomycterus spinosus mauret.	0.24	2	0.09		Calappa pelii
Microchirus frechkopi	0.20	6	0.07		Grammoplites gru
Thorogobius sp.	0.20	48	0.07		Penaeus notialis
Brachydeuterus auritus	0.18	40	0.07	0	Decapterus puncta
ARCIDAE	0.14	4	0.05		Antennarius sp.
GASTROPODS	0.08	2	0.03		Lutianus fulgens
Saurida brasiliensis	0 04	1.8	0 01		Cubicens sp
Arnoglossus imperialis	0.04	8	0.01		Apogon sp
MACTRIDAE	0.04	2	0.01		Arnoglossus imper
Scorpage lagvie	0.04	2	0.01		Solonocora africa
Priacanthus en	0.04	2	0.01		MURICIDAE
Conola en	0.02	2	0.01		ADCIDAD
'Molo crah'	0.02	4	0.01		Todaroneie oblast
Piore crab	0.02	0	0.01		ICalappa babul
Serranus sp. Heemstra	0.02	2	0.01		Starfish
Total	274.54		100.00		Saurida brasilier
					Exodromidia sp. SQUILLIDAE

R/V Dr. Fridtjof Nansen SURVEY:20	10405 STATION: 31
DATE :18.05.2010 GEAR TYPE: B	T NO: 24 POSITION:Lat N 0'15.48
start stop duration	Lon E 6'4/.10
TIME :1/:06:42 1/:36:35 29.9 (min)	Purpose : 2
LUG : 322.27 323.65 1.4	Region : 3210
FDEPTH: 64 /1	Gear cond.: U
BDEPTH: 64 /1	Validity : U
rowing dir: 0 wire out : 1/5	m Speed : 2.8 kn
Sorted : 4/ Total catch: 46.91	Catch/hour: 94.1/
SPECIES	CATCH/HOUR % OF TOT. C SAME
	weight numbers
Pagellus bellottii	24.09 141 25.58 191
Dactylopterus volitans	19.27 134 20.46 192
Fistularia petimba	13.35 38 14.18
Sepia officinalis	6.16 18 6.54 198
Pomadasys incisus	5.72 38 6.08 194
Pseudupeneus prayensis	3.71 42 3.94 193
Drepane africana	3.61 6 3.84
Dentex congoensis	3.17 181 3.37 195
Octopus vulgaris	3.11 4 3.30
Selar crumenophthalmus	2.75 8 2.92
Galeoides decadactylus	2.71 8 2.88 196
Syacium micrurum	1.65 8 1.75
Sphyraena sphyraena	1.49 4 1.58
Pagrus caeruleostictus	0.94 4 1.00 197
Sardinella maderensis	0.80 4 0.85
Ariosoma sp.	0.54 2 0.58
Trachinocephalus myops	0.54 2 0.58
Alloteuthis africana	0.24 183 0.26
Citharus linguatula	0.24 18 0.26
Lesueurigobius sp.	0.02 14 0.02
Arnoglossus imperialis	0.02 2 0.02
Brachydeuterus auritus	0.02 2 0.02
Total	94.17 100.00

V Dr. Fridtjof Nansen SURVEY:20	10405	STATION:	32		
DATE :18.05.2010 GEAR TYPE: B	T NO: 24 H	POSITION:Lat	: N 0°9.7'	7	
start stop duration		Lor	1 E 6°42.	19	
IME 19:05:35 19:33:49 28.2 (min)	Purp	ose : 2	0		
106 : 331.06 332.61 1.6 1000000, 65 55	Reg:	cond : 321	10		
DEPTH: 65 55	Vali	dity 0			
Cowing dir: 0° Wire out : 170	m Snee		2 kn		
Sorted : 232 Total catch: 232.0	7 Cato	h/hour: 493	3.08		
SPECIES	CATCH	H/HOUR %	OF TOT. C	SAMP	
	weight	numbers			
Physiculus cf huloti	254.96	2	51.71		
Pagellus bellottii	82.86	489	16.80	199	
Galeoides decadactylus	32.29	83	6.55	201	
Prometnichtnys prometneus	16 36	72	3 32	200	
Svacium micrurum	10.30	166	2 07	200	
Boops boops	8.50	261	1.72		
Pomadasys rogeri	5.97	6	1.21	205	
MYCTOPHIDAE	5.82	903	1.18		
Pomadasys incisus	5.72	40	1.16	207	
Pseudupeneus prayensis	5.31	106	1.08	204	
Pagrus caeruleostictus	4.97	70	1.01	202	
Sepia officinalis	4.89	38	0.99	209	
Fistularia petimba	4.5/	11	0.93	0.07	
Pseudotolitnus senegalensis	3.72	1120	0.75	206	
Dentex congoensis	3 34	370	0.73	203	
Citharus linguatula	2.66	125	0.54	205	
Chilomycterus spinosus mauret.	2.32	11	0.47		
Psettodes belcheri	2.19	11	0.44	208	
CONGRIDAE	1.70	57	0.34		
Octopus vulgaris	1.49	4	0.30		
Torpedo 5 very weak spots	0.93	2	0.19		
Priacanthus arenatus	0.87	8	0.18		
Aluterus heudelotii	0.76	2	0.16		
Chilomycterus spinosus mauret.	0.70	4	0.14	0	
Sardinella maderensis	0.55	0	0.11		
NETTASTOMATIDAE	0.53	30	0.11		
Calappa pelii	0.45	11	0.09		
Grammoplites gruveli	0.42	11	0.09		
Penaeus notialis	0.36	8	0.07		
Decapterus punctatus	0.34	11	0.07		
Antennarius sp.	0.32	2	0.06		
Lutjanus fulgens	0.30	2	0.06		
Cubiceps sp.	0.30	32	0.06		
Apogon sp.	0.28	45	0.06		
Arnoglossus imperialis	0.25	62	0.05		
SOLENOCEFA AIFICANA	0.19	/9	0.04		
ARCIDAE	0.15	4	0.05		
Todaropsis eblanae	0.04	2	0.01		
'Calappa baby'	0.04	6	0.01	0	
Starfish	0.04	2	0.01		
Saurida brasiliensis	0.04	11	0.01		
Exodromidia sp.	0.02	2	0.00	0	
SQUILLIDAE	0.02	2	0.00		
Physiculus cf huloti	0.02	4	0.00	0	
Cepoia sp.	0.02	13	0.00		
Derradonthidao - iuvonilo iuvonilo	0.02	2	0.00		
Ansilus fuscus, juvenile	0.01	2	0.00		
	0.00	-	0.00		
Total	493.08		100.00		

DATE :18.05.2010 GEAR TYPE: BT I	405 NO:24 F	STATION: OSITION:Lat	33 N 0°15.	94
start stop duration		Lor	ь Е 6°47.	11
TIME :21:59:20 22:29:35 30.2 (min)	Purp	ose : 2		
LOG : 345.81 347.24 1.4	Regi	on : 321	. 0	
FDEPTH: 59 68	Gear	cond.: 0		
BDEPTH: 59 68	Vali	dity : 0		
Towing dir: 0° Wire out : 175 m	Spee	d : 2.8	kn	
Sorted : 98 Total catch: 184.59	Cato	h/hour: 366	.26	
SPECIES	CATCH	HOUR %	OF TOT. C	SAN
Destulanterus velitore	124 02	700	26 04	21
Pagellus bellettii	62 70	575	17 12	21
Pageilus Delloccii	42.70	2710	11.70	21
Ariocoma en	21 93	5710	5 96	21
Arrosoma sp.	10.00	05	5.50	21
Supple officiality	13 10	219	3.42	21
Fietularia potimba	11 00	210	3.30	
Process beens	10 97	276	2.43	
BUUDS DUUDS MYCEODUIDAR	10.8/	276	2.9/	
Dremethichthus prometheus	1.94	3288	2.1/	
Prometnichtnys prometneus	6.39	16/	1.74	21
Galeoides decadactylus	6.07	10	1.00	21
Pseudupeneus prayensis	5.10	/5	1.41	21
Octopus Vulgaris	3.73	000	1.02	
cubiceps sp.	3.25	200	0.90	
Chilomycterus spinosus mauret.	1.79	8	0.49	0.1
Pseudotolithus senegalensis	1.77	2	0.48	21
Pomadasys incisus	1./1	8	0.47	
Oranoscopus polili	1.35	4	0.42	
Ophichtnus ophis	1.19	4	0.33	
Upnidion sp.	0.99	87	0.27	
Chainna anall nan aann	0.95	700	0.20	
Shrimps, Smarr, non comm.	0.05	122	0.23	
Concle on	0.75	71	0.22	
Cepoia sp. Migrachimus frashkani	0.50	/ 1	0.13	
Ancrochilds liechkopi	0.32	- C	0.12	
Apogon sp. Rhyeiculus of huloti	0.44	16	0.12	
Involution CI Hulber	0.00	10	0.10	
Trachinocophalue muone	0.32	4	0.05	
Citharus linguatula	0.24	16	0.07	
Decenterus punctatus	0.24	10	0.07	
Arnoglossus imperialis	0.24	52	0.07	
Scuilla mantis	0.14	4	0.04	
Pagrus caeruleostictus	0.16	4	0.04	
Bothus nodas africanus	0.12	4	0.03	
CEPHALOPODA	0.12	4	0.03	
Lesueurigobius sp	0.02	20	0.02	
Physicalus cyanostrophais	0.00	20	0.02	
Supagrops bellus	0.08	8	0.02	
Stomiae en	0.00	4	0.02	
Cronius rubor	0.04		0.01	
NEALAS TARA	0.04	4	0.01	
Cadalla imbarbie	0.04	4	0.01	
Addella imperpis	0.04	4	0.01	
Apailua luscus Cohidao en l'hare!	0.01	2	0.00	
Gubruae Sp. Dars	0.00	2	0.00	
Tetradontnidae - juvenile				

R/V Dr. Fridtjof Nansen SUR	VEY:2010405	24 -	STATION	: 34	
DAIL :10.03.2010 GEAR I	IFE: BI NO:	24 1	.0311100.1	at N 0 9.5	61
Start Stop duratio	n 	Decem	L.	on E 6 42.	01
11ME 123137122 00128102 30.7 (III	(111)	Purp	ose : 2	21.0	
LUG : 355.42 356.94 1.5		Reg1	on : 3.	210	
DDF1R: 04 55		Weld	ditu 0		
DDEFIN: 04 JJ	175	Crock	.arcy : 0	0 1-10	
Sorted : 81 Total catch:	135.88	Cato	h/hour: 2	65.82	
SPECIES		CATCH	/HOUR	% OF TOT. C	S
	we	ight	numbers		
Pagellus bellottii		58.30	470	21.93	
Dactylopterus volitans		50.08	219	18.84	
Galeoides decadactylus	-	24.06	57	9.05	
Dentex congoensis		22.89	1336	8.61	
Syacium micrurum		13.11	112	4.93	
MYCTOPHIDAE		11.74	2934	4.42	
Brotula barbata		10.66	33	4.01	
Boops boops		8.65	182	3.25	
Pseudupeneus prayensis		8.49	90	3.19	
Promethichthys prometheus		8.41	227	3.16	
Physiculus cyanostropheis		5.40	209	2.03	
Sepia officinalis		5.32	6	2.00	
Citharus linguatula		5.24	203	1.97	
Pagrus caeruleostictus		4.58	47	1.72	
Fistularia petimba		4.30	16	1.62	
Chilomycterus spinosus mauret.		3.33	12	1.25	
Sepia officinalis		2.66	184	1.00	
Epinephelus aeneus		2.15	2	0.81	
Pomadasys rogeri		2.11	2	0.79	
Psettodes belcheri		1.70	4	0.64	
Grammoplites gruveli		1.41	31	0.53	
ARCIDAE		1.41	51	0.53	
Pomadasys incisus		1.37	12	0.52	
Chelidonichthys gabonensis		1.17	4	0.44	
Bathyuroconger vicinus		0.94	47	0.35	
NETTASTOMATIDAE		0.90	90	0.34	
Lesueurigobius sp.		0.78	235	0.29	
Lepidotrigla carolae		0.51	27	0.19	
Microchirus frechkopi		U.51	12	0.19	
GASTROPODS		U.47	8	0.18	
Calappa pelii		0.47	8	0.18	
Cubiceps sp.		0.47	43	0.18	
Apogon sp.		0.39	0	0.15	
Umbrina canariensis		0.31	2	0.12	
Cepola sp.		0.23	27	0.09	
Arnoglossus imperialis		0.23	59	0.09	
Plesionika martia		U.23	98	0.09	
PARALEPIDIDAE		0.20	8	0.07	
Physiculus cf huloti		0.20	23	0.07	
Decapterus punctatus		0.08	4	0.03	
GONEPLACIDAE		0.08	16	0.03	
PORTUNIDAE		0.04	4	0.01	
Thorogobius sp.		0.04	8	0.01	
Sardinella maderensis		0.04	12	0.01	
'Calappa baby'		0.04	12	0.01	
MURICIDAE		0.04	4	0.01	
Decapterus punctatus, juvenile		0.04	4	0.01	
Synagrops bellus		0.04	4	0.01	
Total	- 20	65.82		100.00	

/V Dr. Fridtjof Nansen SURVEY:201 ATE -19 05 2010 GEAR TYPE- BT	NO: 24 PO	STATION:	35 N 0°15	81
start stop duration		Lon	E 6°47	09
IME :03:06:28 03:37:10 30.7 (min)	Purpo	se : 2	2017.	0.5
DG : 369.31 370.81 1.5	Regio	n : 321)	n	
DEPTH: 60 71	Gear	cond : 0	0	
DEPTH: 60 71	Valid	itv : 0		
owing dir: 0° Wire out : 185 m	Speed	. 2.9	kn	
orted : 65 Total catch: 77.83	Catch	/hour: 152	.06	
SPECIES	CATCH/	HOUR %	OF TOT. C	SA
	weight	numbers		
Dactylopterus volitans	45.52	270	29.94	2
Pagellus bellottii	29.50	291	19.40	2
Dentex congoensis	22.23	3468	14.62	2
Promethichthys prometheus	13.09	436	8.61	
Ariosoma sp.	8.99	39	5.91	
MYCTOPHIDAE	6.64	1803	4.37	
Sepia officinalis	6.35	51	4.18	2
Boops boops	4.49	164	2.96	
Syacium micrurum	3.81	27	2.51	
Galeoides decadactylus	2.81	8	1.85	2
Pseudupeneus prayensis	1.54	21	1.02	2
Chilomycterus spinosus mauret.	0.70	4	0.46	
Fistularia petimba	0.68	_ 4	0.45	
Ophidion sp.	0.66	57	0.44	
Decapterus punctatus	0.66	25	0.44	
Grammoplites gruveli	0.47	8	0.31	
Citharus linguatula	0.39	12	0.26	
ARCIDAE	0.39	16	0.26	
Octopus vulgaris	0.33	2	0.22	
Bathyuroconger vicinus	0.23	8	0.15	
Fistularia petimba, juvenile	0.21	8	0.14	
Physiculus cyanostropheis	0.21	14	0.14	
Cubiceps sp.	0.21	20	0.14	
Ophidion sp.	0.20	16	0.13	
Trachinus armatus	0.20	4	0.13	
Starfish	0.18	6	0.12	
Pomadasys incisus	0.18	2	0.12	
Fistularia petimba	0.16	8	0.10	
Bothus podas africanus	0.16	8	0.10	
Cepola sp.	0.12	14	0.08	
NETTASTOMATIDAE	0.12	4	0.08	
ARCIDAE	0.12	6	0.08	
'Mole crab'	0.08	8	0.05	
Grammoplites gruveli	0.08	2	0.05	
Lesueurigobius sp.	0.08	41	0.05	
Parantnias furcifer	0.04	2	0.03	
Solenocera atricana	U.04	16	0.03	
Bathyuroconger vicinus	0.04	2	0.03	
Antennarius sp.	0.04	2	0.03	
Decapterus punctatus	0.04	2	0.03	
Arnoglossus imperialis	0.02	2	0.01	
MURICIDAE	0.02	2	0.01	
Squilla mantis	0.02	2	0.01	
Apsilus fuscus, juvenile	0.00	2	0.00	
met el	152 06		100.00	

R/V Dr. Fridtjof Nansen	SUR	VEY:2010	0405		STATI	DN:	36	
DATE :19.05.2010	GEAR T	YPE: BT	NO:	24 P	OSITION	Lat	N 0°9.8	6
start stop	duration	n				Lon	E 6°42.	55
TIME :05:06:14 05:36:41	30.5 (m:	in)		Purp	ose :	2		
LOG : 379.62 381.20	1.6			Regi	on :	3210		
FDEPTH: 65 55				Gear	cond.:	0		
BDEPTH: 65 55				Vali	dity :	0		
Towing dir: 0° Wire	out :	170 m		Spee	d :	3.1	kn	
Sorted : 160 Total	catch:	159.72		Catc	h/hour:	314.	72	
SPECIES				CATCH	/HOUR	80	F TOT. C	SAME
			we	ight	number	s		
Galeoides decadactvlus			13	30.05	26	C	41.32	235
Pagellus bellottii				47.59	26	б	15.12	
Drepane africana				34.09	6	3	10.83	
Selar crumenophthalmus				12.12	3	7	3.85	
Pomadasys incisus				11.82	9	3	3.76	
Brotula barbata				10.34	1	6	3.29	
Pomadasys rogeri				7.29		3	2.32	233
Syacium micrurum				7.29	7	1	2.32	
Dactylopterus volitans				6.50	3	3	2.07	234
Sepia officinalis				5.42	2	6	1.72	
Pagrus caeruleostictus				5.32	3	9	1.69	
Pseudupeneus prayensis				4.73	3	5	1.50	
Sphyraena sphyraena				4.71	1	б	1.50	
Priacanthus arenatus				4.43	1	6	1.41	
Psettodes belcheri				4.16	1	2	1.32	
Chaetodipterus goreensi	s			3.61		2	1.15	
Octopus vulgaris				1.83		4	0.58	
Epinephelus aeneus				1.48		2	0.47	
Albula vulpes				1.44		2	0.46	
Uraspis secunda				1.44		2	0.46	
Fistularia petimba				1.40		4	0.44	
Dentex congoensis				1.12	3	C	0.36	
Chilomycterus spinosus	mauret.			1.06		б	0.34	
Alloteuthis africana				0.99	25	6	0.31	
Citharus linguatula				0.89	3.	2	0.28	
Chelidonichthys gaboner	sis			0.85		б	0.27	
Invertebrate				0.59	2	2	0.19	
CONGRIDAE				0.53		2	0.17	
Lutjanus fulgens				0.47		2	0.15	
Scorpaena laevis				0.35		2	0.11	
Saurida brasiliensis				0.26	7	7	0.08	
Torpedo torpedo				0.24		4	0.08	
Arnoglossus imperialis				0.16		3	0.05	
CEPHALOPODA				0.06	3	5	0.02	
Paranthias furcifer				0.04		2	0.01	
Serranus sp. Heemstra				0.04		6	0.01	
Cepola sp.				0.02		2	0.01	
m + + + 1		_		14 70		_	100.00	
IULAI			2.	14.72			100.00	

R/V Dr. Fridtjof Nansen SURVEY DATE 19.05.2010 GERR TYPE statt stop duration TIME :08:02:57 08:32:59 30.0 (min) LOG LOG :397.11 1.4 PDETTH: 60 68 DBETTH: 60 68 Towing dir: 0° Wire out : 17 Sorted : 87 Total catch: 87	2010405 : BT NO: 24 PC Regic Gear Valic 0 m Speec .18 Catch	STATION: Lat ISITION: Lat Ise : 2 nn : 321 cond.: 0 lity : 0 l : 2.8 /hour: 174	37 N 0°15.9 E 6°47.1 0 kn .24	91
SPECIES Pagellus bellottii Dactylopterus volitans Sepia officinalis Fistularia petimba Dentex congoensis Syacium micrurum Pseudupeneus prayensis Chilomycterus spinosus mauret. Acanthoartanscing quineensis Decapterus punctatus Pagrus caeruleostictus C E P H A L O P O D A Citharus linguatula	CARCH/ weight 70.25 68.85 19.79 3.80 2.56 2.36 1.00 0.82 0.40 0.32 0.26 0.04	HOUR % numbers 362 456 60 14 260 14 32 6 2 18 6 150 2	OF TOT. C 40.32 39.52 11.36 2.18 2.18 1.47 1.35 0.57 0.47 0.23 0.18 0.15 0.02	SAMP
Total	174.24		100.00	

Date 119:03.2010 GEAR TIPE: start stop duration TIME :10:00:48 10:31:00 30.2 LOG : 403.94 405.40 1.5 FDEPTH: :65 57 BDEPTH: :65 57 Towing dir: :0° Wire out : 170 Sorted :99 Total catch: 98.5	Purpos Region Gear c Validi m Speed 5 Catch/	e : 2 : 32: ond.: 0 ty : 0 : 2.9 hour: 199	9 kn 5.73	9
TIME :10:00:48 10:31:00 30:22 (min) LOG : 403.94 405.40 1.5 FDEFTH: 65 57 BDEFTH: 65 57 Towing dir: 0° Wire out : 170 Sorted : 99 Total catch: 98.5	Purpos Region Gear c Validi m Speed 5 Catch/	e : 2 : 32: ond.: 0 ty : 0 : 2.9 hour: 19	n E 6 42.5: 10 9 kn 5.73	3
TIME 1000048 1033100 30.2 (mfn) LOG : 403.94 405.40 1.5 FDEPTH: 65 57 BDEPTH: 65 57 Towing dir: 0° Wire out : 170 Sorted : 99 Total catch: 98.5	m Speed 5 Catch/	e : 2 : 32: ond.: 0 ty : 0 : 2.! hour: 19	10 9 kn 5.73	
LOG : 403.94 403.40 1.5 FDEPTH: 65 57 BDEPTH: 65 57 Towing dir: 0° Wire out : 170 Sorted : 99 Total catch: 98.5	Megion Gear c Validi m Speed 5 Catch/	ond.: 0 ty : 0 : 2.9 hour: 19	9 kn 5.73	
BDEFTH: 65 57 Towing dir: 0° Wire out : 170 Sorted : 99 Total catch: 98.5	m Speed 5 Catch/	ty : 0 : 2.9 hour: 19	9 kn 5.73	
BDEFTH: 65 5/ Towing dir: 0° Wire out : 170 Sorted : 99 Total catch: 98.5	m Speed 5 Catch/	ty : 0 : 2.9 hour: 19	9 kn 5.73	
Sorted : 99 Total catch: 98.5	5 Catch/	hour: 19	5.73	
Sorted : 99 Total catch: 98.5	5 Catch/	nour: 19:	5./3	
OPPOTES				
SFECTES	CATCH/H	OUR %	OF TOT. C	SAMP
	weight n	umbers		
Drepane africana	53.62	121	27.40	
Galeoides decadactylus	51.44	137	26.28	
Pagellus bellottii	32.57	141	16.64	
Pagrus caeruleostictus	10.53	48	5.38	
Selene dorsalis	7.94	20	4.06	
Pomadasys incisus	6.34	46	3.24	
Sepia officinalis	5.94	16	3.03	
Octopus vulgaris	5.22	6	2.67	
Brotula barbata	4.47	4	2.28	
Pseudupeneus prayensis	4.17	50	2.13	
Syacium micrurum	3.10	34	1.58	
Dactylopterus volitans	2.78	20	1.42	
Branchiostegus semifasciatus *	2.60	2	1.33	
Brachydeuterus auritus	1.93	356	0.98	
Citharus linguatula	1.17	38	0.60	
Psettodes belcheri	0.83	2	0.43	
Decapterus punctatus	0.58	2	0.29	
Lesueurigobius sp.	0.14	32	0.07	
Microchirus frechkopi	0.14	4	0.07	
Alloteuthis africana	0.12	91	0.06	
Grammoplites gruveli	0.10	2	0.05	
Total	195.73		100.00	
	Drepane africana Galeoided decadactylus Pagellus bellottil Pagrus caeruleosticus Selene dorsalis Pomadasys incisus Sepia officinalis Octopus vulgaris Brotula barbata Paeudupeneus prayensis Syacium miccruum Dactylopterus volitans Brachoistegus semifasciatus * Brachydeuterus auritus Citarus linguatula Paettodes belcheri Decapterus punctatus Lesueurigobius sp. Microchirus frechkopi Alloteuthis africana Grampjites gruveli	Drepane africana33.62Galeoides decadactylus51.44Pagelus bellottii32.57Pagrus caeruleostictus10.53Selene dorsalis7.94Pomadasys incisus6.34Sepiene dorsalis5.94Octopus vulgaris5.22Brotula barbata4.47Pseudupeneus prayensis4.17Pseudupeneus prayensis3.10Dactylopterus volitans2.78Brachcistegus semifasciatus *1.93Citharus linguaula1.17Psettodes belcheri0.83Decapterus punctuus0.58Lesueurigobius sp.0.14Alloteuthis africana0.12Grammoplites gruveli0.12Total195.73	Drepane africana 51.62 121 Galeoides decadactylus 51.44 137 Pagulus bellottii 32.57 141 Paguus caeruleostictus 10.53 48 Selene dorsalis 7.94 20 Pomadasys incisus 6.34 46 Octopus vulgaris 5.22 6 Drotula barbata 4.47 4 Pseudupeneus prayensis 4.17 50 Syacium micrurum 3.10 34 Dactylopterus volitans 2.78 20 Branchiostegus semifasciatus * 1.93 356 Citharus linguatula 1.17 38 Psettodes belcheri 0.683 2 Decapterus punctatus 0.58 2 Lesweurigobius sp. 0.14 32 Microchirus freickopi 0.14 4 Alloteuthis africana 0.12 91 Grammoplites gruveli 0.10 2	Drepane africana 53.62 121 27.40 Galeoides decadactylus 51.64 137 26.28 Pagellus bellottii 32.67 141 16.64 Pagrus caeruleostictus 10.53 48 5.38 Selene dorsalis 7.94 20 4.06 Pomadasys incisus 6.34 46 3.24 Sepine dorsalis 5.22 6 2.67 Detopus vulgaris 5.22 6 2.67 Datylopterus voltans 2.78 20 1.42 Paeudupeneus prayensis 4.17 50 2.13 Syacium micrurum 3.03 356 0.98 Datylopterus volitans 2.78 20 1.42 Branchoistegus semifasciatus 1.93 356 0.98 Citharus linguatula 1.17 38 0.60 Paettodes belcheri 0.83 2 0.43 Decapterus punctatus 0.58 2 0.29 Leswerigobius sp. 0.14 32 0.07

R/V Dr. Fridtjof Nansen	SURVEY:2	2010405	STATIO	N: 39	
DATE :19.05.2010	GEAR TYPE:	BT NO: 24	POSITION:	Lat N 0°15.	74
start stop	duration			Lon E 6°47.	11
TIME :12:59:56 13:30:26	30.5 (min)	E	urpose :	2	
LOG : 416.99 418.31	1.3	F	legion :	3210	
FDEPTH: 62 71		G	Gear cond.:	0	
BDEPTH: 62 71		7	/alidity :	0	
Towing dir: 0° Wire	out : 180	m S	speed :	2.6 kn	
Sorted : 124 Total	catch: 124.	.33 C	latch/hour:	244.58	
SPECIES		CA	TCH/HOUR	% OF TOT. C	SAMP
		weigh	nt numbers		
Dactylopterus volitans		129.	84 855	53.08	241
Pagellus bellottii		64.	92 461	26.54	240
Sepia officinalis		18.	49 65	7.56	237
Dentex congoensis		9.	05 384	3.70	236
Pseudupeneus prayensis		4.	37 47	1.79	238
Octopus vulgaris		з.	86 6	1.58	
Fistularia petimba		3.	74 14	1.53	
Syacium micrurum		1.	97 14	0.80	
Pagrus caeruleostictus		1.	85 14	0.76	239
Balistes capriscus		1.	24 2	0.51	
Chilomycterus spinosus	mauret.	1.	16 8	0.47	
Alloteuthis africana		1.	06 464	0.43	
Galeoides decadactylus		0.	92 4	0.38	
Aluterus monoceros		0.	69 2	0.28	
Drepane africana		0.	63 2	0.26	
Seriola carpenteri		0.	41 2	0.17	
ARCIDAE		0.	18 4	0.07	
Starfish		0.	16 4	0.06	
Citharus linguatula		0.	04 8	0.02	
Arnoglossus imperialis		0.	02 2	0.01	
Total		244.	58	100.00	

bin: start stop duration ho. 14 start stop duration TIME start stop duration TIME start stop duration TIME starts stop duration TIME starts stop duration TIME starts stop duration FUEPTH: 57 65 Towing dir: 0° Wire out : 175 m S Sorted : 120 Total catch: 120.40 SPECIES CA Galeoides decadactylus 63. Drepane africana 51. Pagrus caeruleostictus 31. Pagrus caeruleostictus 77. Dectylopterus volitans 13. Pomadasys incjus 7. Presudpeneus prayensis 7. Dentex congoensis 1. Aluterus linguatula 6. Cramoplites gruveli 0. Chilomyoterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Gramoplites gruveli 0. Chilomyoterus spinosus mauret. 0. Alloteuthis africana 0. Pricacanthus areantus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii	urpose : egion : ear cond.: (alidity :) peed : atch/hour: 1 TCH/HOUR t numbers 51 181 87 116 18 73	Lon E 6°41.68 2 3210 0 3.1 kn 237.48 % OF TOT. C SZ
TIME :15 and 1 550.9 30.4 (min) P LOG : 429.93 431.51 1.6 P LOG : 429.93 431.51 1.6 P DEFTH: 57 65 G DEFTH: 57 65 G SPECIES CA SPECIES CA Galeoides decadactylus 63. Drepane africana 51. Pagrus caeruleostictus 31. Pagrus bellotti 27. Dactylopterus volitans 13. Pomadasys incisus 7. Pomadasys incisus 7. Prouda barbata 4. Shyraena sphyraena 3. Branchicstegus semifasciatus * 2. Citharus linguatula 1. Paetudpensis 1. Aluterus monoceros 1. Fistularia petimba 0. Sardinella maderensis 0. Sepia officinalis 0. Caramoplites gruveli 0. Chilomyoterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Chilomyoterus spinosus mauret. 0. Alloteuthis africana 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	urpose : egion : ear cond.: alidity : peed : atch/hour: TCH/HOUR t numbers 51 181 87 116 18 73	8 OF TOT. C SF
<pre>100 : 429.33 431.51 51 1.6 FDEFTH: 57 65 V Towing dir: 0* Wire out : 175 m S Sorted : 120 Total catch: 120.40 C SPECIES C Galocides decadactylus exemption Galocides decadactylus 63. Drepane africana 51. Pagrus caeruleostictus 31. Pagrus caeruleostictus 31. Pagrus caeruleostictus 31. Pomadasys rogeri 73. Pomadasys rogeri 73. Pomadasys rogeri 74. Pomadasys rogeri 74. Pomadasys rogeri 75. Presudpmenus prayensis 77. Presudpmenus prayensis 77. Brotula barbata 74. Syacium micrurum 44. Syphyraena sphyraena 35. Drapane sphyra</pre>	egion : ear cond.: alidity : peed : atch/hour: TCH/HOUR t numbers 51 181 87 116 18 73	3210 0 3.1 kn 237.48 % OF TOT. C SZ
Deepri: D.77 65 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	ear cond.: alidity : peed : atch/hour: TCH/HOUR t numbers 51 181 87 116 18 73	0 0 3.1 kn 237.48 % OF TOT. C SF
BDEPTH: 57 65 Towing dir: 0* Wire out : 175 m S Sorted : 120 Total catch: 120.40 C SPECIES CA weigh Galeoides decadactylus 63. Drepane africana 51. Pagrus caerulestictus 31. Pagrus caerulestictus 7. Pomadasys rogeri 7. Pomadasys rogeri 7. Predule baltottii 27. Bactylopterus volitans 7. Pomadasys rogeri 7. Predule barbata 7. Syacium micrurum 4. Syhyraena sphyraena 3. Baranchostegus semifasciatus * 2. Citharus linguatula 1. Paettodes belcheri 1. Julterus monoceros 1. Pistularia petimba 0. Sardinella maderensis 0. Gramoplites gruveli 0. Othiomyoterus spinosus mauet. 0. Athoteuthis africana 0. Thorogobius sp. 0. Chilomyoterus apinosus mauet. 0. Athoteuthis africana endois 0. Chilomyoterus apinosus mauet. 0. Dubrina canariensis 0.	alidity : peed : atch/hour: 1 TCH/HOUR t numbers 51 181 87 116 18 73	0 3.1 kn 237.48 % OF TOT. C SF
Towing dir: 0° Wire out : 175 m S Sorted : 120 Total catch: 120.40 C SPECIES C Galeoides decadactylus 63. Prepane africana 51. Pagrus Caeruleostictus 31. Pagrus caeruleostictus 31. Pagrus caeruleostictus 31. Pomadasys rogeri 7. Pomadasys rogeri 7. Predulpeneus prayensis 7. Predulpeneus prayensis 7. Predulpeneus prayensis 7. Brotula barbata 4. Syacium micrurum 44. Sphyraena sphyraena 3. Branchiostegus semifasciatus 2. Citharus linguatula 1. Paetudes belcheri 1. Aluterus monceros 1. Aluterus monceros 1. Fistularia petimba 0. Sardinella maderensis 0. Grammoplites gruveli 0. Umbrina canariensis 0. Chilomyctrus spinosus mauret. 0. Aluteruthis africana 0. Thorogobius sp. 0. Aluteruthis africana 0. Frachydeuterus auritus, juvenile 0.	peed : atch/hour: TCH/HOUR t numbers 51 181 87 116 18 73	3.1 kn 237.48 % OF TOT. C S#
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Drepane africana 51. Paquus caeruleostictus 31. Pagellus bellottii 27. Dactylopterus volitans 13. Pomadasys rogeri 7. Peeudupeneus prayensis 7. Pseudupeneus prayensis 7. Breudupeneus prayensis 7. Stroutu barbata 4. Syacium micrurum 4. Sphyraena sphyraena 3. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Pettodes belcheri 1. Albula vulpes 1. Albula vulpes 1. Pistuaria petimbasis 0. Segia officinalis 0. Gramoplites gruveli 0. Ochiomyterus spinosus mauret. 0. Allotæuthis africana 0. Thorogobius sp. 0. Pathyuroconger vicinus 0. Pathyuroconger vicinus 0. Pricacnthus arentus auritus, juvenile 0.	87 116 18 73	26.74 2
Pagrus caeruleostictus 31. Pagelus beliottii 27. Dactylopterus volitans 13. Pomadasys rogeri 7. Pomadasys rogeri 7. Pomadasys rogeri 7. Pomadasys rogeris 7. Pomadasys incisus 7. Posculpeneus prayensis 7. Brotula barbata 4. Sybyraena sphyraena 3. Branchostegus semifasciatus * 2. Citharus linguatula 1. Paetudes belcheri 1. Abuta vulpes 1. Aluterus monoceros 1. Aluterus monoceros 1. Pistularia petimba 0. Sardinella maderensis 0. Octopus vulgaris 0. Gramoplites gruveli 0. Ubbrina canariensis 0. Chilomyoterus spinosus maret. 0. Albuteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Priacanthus arenatus 0. <	18 73	21.84
Pagellus bellottii 27. Dactylopterus volitans 13. Pomadasys rogeri 7. Pseudupeneus prayensis 7. Pseudupeneus semifasciatus * 4. Spariam Sphyraena 3. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Pettodes belcheri 1. Albula vulpes 1. Letterus congoensis 1. Albula vulpes 0. Sarida brasillensis 0. Sepio oficinisis 0. Gramoplites gruveli 0. Ubbrina canariennis 0. Chilomyterus spinosus mauret. 0. Albuteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arentus auritus, juvenile 0. Calappa pelii 0.		13.13 2
Dactylopterus volitans 13. Pomadasys roqeri 7. Pomadasys roqeri 7. Pomadasys roqeri 7. Pomadasys roqeri 7. Protula barbata 7. Syacium micrurum 4. Sphyraena sphyraena 3. Branchostegus semifasciatus * 2. Citharus linguatula 1. Paetudoes belcheri 1. Abuta vulpes 1. Aluterus monoceros 1. Fistularia petimba 0. Sardinella maderensis 0. Gepia officinalis 0. Catopus vulgaris 0. Octopus vulgaris 0. Chilomyoterus spinous mauret. 0. Albuteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brathyuroconger vicinus 0. Catapap apelii 0.	32 146	11.50 2
Pomadasys rogeri 7. Pomadasys incisus 7. Pseudupeneus prayensis 7. Stroub abrabat 4. Spavaium micrurum 4. Sphyraena sphyraena 3. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Psettodes belcheri 1. Saurida brasillensis 1. Albula vulpes 1. Pentex congoensis 1. Aluterus monocros 1. Fistularia petimosis 0. Sepie of circlinis 0. Gramoplites gruveli 0. Othornovcreus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Priacanthus arentus 0. Priacanthus arentus 0. Calappa pelii 0. Calappa pelii 0.	12 69	5.52 2
Pomadasys incisus 7. Pseudupeneus prayensis 7. Brotula barbata 4. Syacium micrurum 4. Sphyraena sphyraena 3. Branchostegus semifasciatus * 2. Citharus linguatula 1. Psettodes belcheri 1. Abula vulpes 1. Dentex congoensis 1. Aluterus monoceros 1. Fistularia petimba 0. Segia officinalis 0. Catopus vulgaris 0. Grammoplites gruveli 0. Ubbrina canariensis 0. Aluteruthis africana 0. Thocogobius sp. 0. Alutorethus arentus 0. Bathyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0.	51 8	3.16 2
Pseudupeneus prayensis 7. Brotula barbata 4. Syacium micrurum 4. Sphyraena sphyraena 3. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Psettodes belcheri 1. Saurida brasiliensis 1. Albula vulpes 1. Dentex congoensis 1. Altuterus morecos 1. Pistularia petimbasis 0. Sepia officinalis 0. Octopus vulgaris 0. Grarmoplites gruveli 0. Unbrina canariennis 0. Alloteuthis africana 0. Thorogobius sp. 0. Pathyroconger vicinus 0. Priacanthus arentus 0. Bathyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	46 49	3.14 2
Brotula barbata 4. Syacium micrurum 4. Sphyraena sphyraena 3. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Psettodes belcheri 1. Saurida brasiliensis 1. Albula vulpes 1. Dentex congoensis 1. Aluterus monoceros 1. Fistularia petimba 0. Sardinella maderensis 0. Cotopus vulgaris 0. Cramoplites gruveli 0. Umbrina canariensis 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0.	34 99	2.97 2
Syacium micrurum 4. Sphyraena sphyraena 3. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Peettodes belcheri 1. Saurida brasiliensis 1. Albula vulpes 1. Dentex congoensis 1. Albula vulpes 1. Aluterus monoceros 1. Pistulatia petimbasis 0. Cotopus vulgaris 0. Grarmoplites gruveli 0. Ochiomyotterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus areatus 0. Calappa pelii 0. Calappa pelii 0.	64 18	1.95
Sphyraena sphyraena J. Branchiostegus semifasciatus * 2. Citharus linguatula 1. Paettodes belcheri 1. Saurida brasiliensis 1. Albula vulpes 1. Dentex congoensis 1. Aluterus monceros 1. Fistularia petimba 0. Sardinella maderensis 0. Gotopus vulgaris 0. Octopus vulgaris 0. Grammolites gruveli 0. Uhbrina canariensis 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0.	16 22	1.75
Branchiostegus semilasciatus * 2. Cithatus linguatula 1. Pettodes belcheri 1. Saurida brasiliensis 1. Albula vulpes 0. Satilata petimesis 0. Satilata petimesis 0. Gotopus vulgaris 0. Gramoplites gruveli 0. Ochiomycherus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacachubs arentus arentus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	J6 12	1.29 2
Citnatus injustila 1. Psettodes belcheri 1. Saurida brasiliensis 1. Jabula vulpes 1. Dentex congoensis 1. Aluterus monoceros 1. Fistularia petimba 0. Sardinella maderensis 0. Sepia officinalis 0. Cotopus vulgaris 0. Grammolites gruveli 0. Umbrina canariensis 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	29 Z	0.96
resttodes beinderi 1. Saurida brasiliensis 1. Albula vulpes 1. Dentex compoensis 1. Aluterus monoceros 1. Aluterus monoceros 1. Sardiala madrensis 0. Sardiala madrensis 0. Sardiala madrensis 0. Sardiala madrensis 0. Cotopus vulgaris 0. Gramoplites gruveli 0. Umbrina canariensis 0. Alloteuthis africana 0. Thorogobius sp. 0. Priacanthus arentus 0. Priacanthus arentus 0. Bathyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	51 01	0.76
Albhla Ulpes 1. Albhla Vulpes 1. Dentex congoensis 1. Littexus monceros 1. Fistularia petimba 0. Sardinella maderensis 0. Sepia officinalis 0. Cotopus vulgaris 0. Octopus vulgaris 0. Chilomyterus spinosus mauret. 0. Albteuthis africana 0. Thorogobius sp. 0. Priacanthus arenatus 0. Brahyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0.	78 4	0.75
niblia Vulpes 1. Dentex componentia 1. Aluterus monotinoa 1. Aluterus monotinoa 1. Sardinella medarensis 0. Sardinella medarensis 0. Cotopus vulgaris 0. Grarmoplites gruveli 0. Chilomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Priacanthus arenstus 0. Bathyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0.	70 43 60 0	0.75
Thirds Compension 1 Aluterus monoceros 1 Fistularia petimba 0. Sardinella maderensis 0. Sepia officinalis 0. Lesueurigobius sp. 0. Octopus vulgaris 0. Grammoplites gruveli 0. Unbrina canariensis 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0.	64 92	0.69 0
Fistularia petimba 0. Sardinella maderensis 0. Sepia officinalis 0. Lesseurigobius sp. 0. Octopus vulgaris 0. Grammoplites gruveli 0. Unbrina canariensis 0. Chilomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arentus 0. Brachydeuterus auritus, juvenile 0.	18 2	0.50
Sardinella maderensis 0. Sepia officinalis 0. Lesueurigobius sp. 0. Octopus vulgaris 0. Grammoplites gruveli 0. Umbrina canariensis 0. Chilomyterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenstus 0. Brachydeuterus auritus, juvenile 0.	65 2	0.27
Sepis officinalis 0. Lesueurigobius sp. 0. Octopus vulgaris 0. Ordinopites gruveli 0. Umbrina canariensis 0. Chilomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arentus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	61 4	0.26
Lesseurigobius sp. 0. Octopus vulgaris 0. Gramoplites gruveli 0. Umbrina canariensis 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Bathyuroconger vicinus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	53 36	0.22
Octopus vulgaris 0. Grarmoplites gruveli 0. Umbrina canariensis 0. Othiomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	51 120	0.22
Grammoplites gruveli 0. Umbrina canariensis 0. Chilomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	51 4	0.22
Umbrina canariensis 0. Chilomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	39 8	0.17
Chilomycterus spinosus mauret. 0. Alloteuthis africana 0. Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	32 2	0.13
Alloteuthis africana 0, Thorogobius sp. 0, Bathyuroconger vicinus 0, Priacanthus arenatus 0, Brachydeuterus auritus, juvenile 0, Calappa pelii 0,	30 2	0.12
Thorogobius sp. 0. Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	16 83	0.07
Bathyuroconger vicinus 0. Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	12 30	0.05
Priacanthus arenatus 0. Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	06 2	0.02
Brachydeuterus auritus, juvenile 0. Calappa pelii 0.	06 4	0.02
Calappa pelii 0.	06 10	0.02
1.1 1	06 6	0.02
Arnoglossus imperialis 0.	04 6	0.02
'Mole crab' 0.		0.02
Physiculus cf huloti 0.	04 6	0.01
GASTROPODS 0.	04 6 02 2	0.01

start stop duration TIME :18:01:19 18:30:55 29.6 (min) LOG : 441.17 442.55 1.4 FDEPTH: 63 72 BDEPTH: 63 72 Towing dir: 0° Wire out :175 m Sorted : 111 Total catch: 111.04 SPECIES	Purp Regi Gear Vali Spee Catc	Lon Dose : 2 Don : 321 cond.: 0 dity : 0 d : 2.8 h/hour: 225	E 6°47.: 0 16	13
TIME :18:01:19 18:30:55 29.6 (min) LOG : 441.17 442.55 1.4 FDEPTH: 63 72 Towing dir: 0° Wire out :175 m Sorted :111 Total catch: 111.04 SPECTES	Purp Regi Gear Vali Spee Catcl	ose : 2 on : 321 cond.: 0 dity : 0 d : 2.8 n/hour: 225	0 kn	
LOG : 441.17 442.55 1.4 FDEPTH: 63 72 BDEPTH: 63 72 Towing dir: 0° Wire out : 175 m Sorted : 111 Total catch: 111.04 SPECIES	Regi Gear Vali Spee Catcl	on : 321 cond.: 0 dity : 0 d : 2.8 n/hour: 225	0 kn	
FDEPTH: 63 72 BDEPTH: 63 72 Towing dir: 0° Wire out : 175 m Sorted : 111 Total catch: 111.04 SPECIES	Gear Valio Spee Catcl	cond.: 0 dity : 0 d : 2.8 n/hour: 225	kn	
BDEPTH: 63 72 Towing dir: 0° Wire out : 175 m Sorted : 111 Total catch: 111.04 SPECIES	Vali Spee Catcl	dity : 0 d : 2.8 n/hour: 225	kn	
Towing dir: 0° Wire out : 175 m Sorted : 111 Total catch: 111.04 SPECIES	Spee Catcl	1 : 2.8 n/hour: 225	kn 16	
Sorted : 111 Total catch: 111.04	Catc	n/hour: 225	16	
SPECIES			.10	
	CATCH	HOUR %	OF TOT. C	SAMP
	weight	numbers		
Dactylopterus volitans	77.05	502	34.22	251
Albula vulpes	47.25	69	20.98	
Pagellus bellottii	29.20	207	12.97	252
Sepia officinalis	16.73	55	7.43	257
Syacium micrurum	9.14	85	4.06	
Dentex congoensis	8.11	578	3.60	253
Boops boops	6.37	310	2.83	258
Galeoides decadactylus	5.88	26	2.61	255
Pseudupeneus prayensis	5.47	85	2.43	256
Promethichthys prometheus	4.50	132	2.00	
Fistularia petimba	3.35	6	1.49	
Cubiceps sp.	3.04	397	1.35	
Ariosoma sp.	2.82	10	1.25	
Pomadasys rogeri	2.03	2	0.90	
Pagrus caeruleostictus	1.22	12	0.54	254
Pomadasys incisus	0.61	4	0.27	
Chilomycterus spinosus mauret.	0.61	2	0.27	
Citharus linguatula	0.49	12	0.22	
Trachinocephalus myops	0.45	4	0.20	
Dicologoglossa hexophthalma	0.36	4	0.16	
Decapterus punctatus	0.26	14	0.12	
Arnoglossus imperialis	0.12	26	0.05	
MURICIDAE	0.06	2	0.03	
Bothus podas africanus	0.04	2	0.02	
Total	225.16		100.00	
	SPECIES Dactylopterus volitans Albula vulpes Pagellus bellottii Sepia officinalis Syacium micrurum Dentex congoensis Boops boops Galeoides decadactylus Pseudupeneus prayensis Promethichthys prometheus Fistularia petimba Cubiceps sp. Ariosoma sp. Pomadasys incisus Chilomycterus spinosus mauret. Citanus linguatula Trachinocephalus myops Dicologuolosas hexophthalma Decapterus punctatus Arnoglossus imperialis MURICIDAE Bothus podas africanus	SPECIES CATCA. Dactylopterus volitans 77.05 Albula vulpes 77.05 Pagellus bellottii 29.20 Sepia officinalis 16.73 Syacium micrurum 9.14 Dentex congoensis 8.11 Boops boops 6.37 Galeoides decadactylus 5.88 Pseudupeneus prayensis 5.47 Promethichthys prometheus 4.50 Fistularia petimba 3.35 Cubicogs sp. 2.82 Pomodadays rogeri 2.03 Pagrus caeruleostictus 1.22 Pomodadays incisus 0.61 Citinocephalus myops 0.49 Trachinocephalus myops 0.46 Dicologolosas hexophthalma 0.36 Decapterus punctatus 0.26 Arnogolassus imperialis 0.12 MURICIDAE 0.04 Total 225.16	CLATCH/HOURVeright numbersAlbula vulpes77.05502Albula vulpes77.05609Pagellus bellottii29.20207Sepia officinalis16.7355Syacium micrurum9.1485Boops boops6.37310Galeoides decadactylus5.8826Promethichthys prometheus4.50132Fistularia petimba3.356Cubiceps sp.3.04397Ariosoma sp.2.8210Pomdadays rogeri2.032Pagrus caeruleostictus1.2212Pomadasys incius0.614Chilonycterus spinosus mauret.0.612Citharcus lingutula0.364Decapterus punctatus0.2614Arnoglossus imperialis0.1226MURICIDAE0.062Bothus podas africanus0.042Total225.162	SPECIES CATCH/HOOK % OF TUT. C Dactylopterus volitans 77.05 502 34.22 Albula vulpes 77.05 502 34.22 Pagellus bellotti 29.20 207 12.97 Sepia officinalis 16.73 555 7.43 Syacium micrurum 9.14 85 4.06 Dentex congensis 8.11 578 2.63 Galeoides decadactylus 5.88 2.62 2.01 Promethichthys prometheus 4.50 1.22 2.00 Fistularia petimba 3.35 6 1.49 Cubicegs sp. 3.04 397 1.35 Ariosoma sp. 2.82 10 1.25 Pomadasys incius 0.61 2 0.27 Chilomycterus spinosus mauret. 0.61 2 0.27 Chinocephalus myops 0.45 4 0.20 Dicologolosas hexophthalma 0.36 4 0.12 Dicologolosas hexophthalma 0.26 14 0.22

Annex II Length distributions of main species







































م المعالم المعا 1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 62 85 88 91 Total length in cm











Total length in cm







Annex III Swept-area biomass estimates

Principe

SAMPLE DISTRIB. BY CATCH CLASSES						Mean	Mean dens. by btm. depth		
	Lower	limits, K	Sg/nm		dence	dens.	strata t/n	m²	
SPECIES NAME	>0	10	30	100		t/nm²	0-30m	30-50m	50-100m
Dactylopterus volitans	6	1	3	1	84.62	2.539		4.181	1.809
Acanthostracion	4	1		1	46.15	1.19		3.821	0.02
quadricornis									
Pagellus bellottii	8	2	1		84.62	0.918		0.045	1.305
Drepane africana			1		7.69	0.541		1.76	
Pagrus caeruleostictus	11				84.62	0.253		0.239	0.259
Sepia officinalis hierredda	9				69.23	0.137		0.159	0.126
Paranthias furcifer		1			7.69	0.134			0.193
Lutjanus fulgens	1	1			15.38	0.126			0.183
	1	1			15.38	0.105			0.152
Fistularia petimba	11				84.62	0.067		0.048	0.076
Lethrinus atlanticus	4				30.77	0.063		0.164	0.019
Diodon holocanthus	4				30.77	0.046		0.143	0.003
Albula vulpes	1				7.69	0.037		0.122	
Balistes capriscus	3				23.08	0.035		0.115	
Alloteuthis africana	9				69.23	0.033			0.047
Decapterus macarellus	3				23.08	0.027		0.084	0.002
Carangoides bartholomaei	2				15.38	0.027		0.088	
Fistularia tabacaria	2				15.38	0.027		0.088	
Caranx crysos	4				30.77	0.024		0.018	0.027
CARANGIDAE	1				7.69	0.023		0.074	
Sphoeroides pachgaster	1				7.69	0.013			0.018
Trachinus radiatus	2				15.38	0.01			0.015
Seriola rivoliana	1				7.69	0.01			0.015
Other fish						0.135	0	0.173	0.118
Sum all species						6.521	0	11.321	4.387
Sum SNAPPERS, JOBFISHE	S					0.133		0.022	0.183
Sum GROUPERS, SEABASS	ES					0.134			0.193
Sum GRUNTS, SWEETLIPS									
Sum CROAKERS, DRUMS, V	WEAKF	, KOBS							
Sum PANDORAS, PORGIES	, SEABF	EAMS,				1.177		0.284	1.574
Sum SHARKS, CHIMAERAS	5								
Sum BATOID FISHES, RAYS	S					0.017		0.001	0.024
Sum CEPHALOPODS						0.169		0.159	0.173
Numbers of stations included i	n analys	is, total a	nd by de	pth strata	ì	13	0	4	9

Sao Tome

SAMPLE DISTRIB. BY CATCH CLA	SSES				% inci-	Mean	Mear	n dens. by bt	m. depth
Lower	limits,	Kg/ni	m		dence	dens.	st	rata t/nm²	
SPECIES NAME	>0	10	30	100		t/nm²	0-30m	30-50m	50-100m
Dactylopterus volitans	2	2	4		100	4.127	7.528	5.618	3.311
Lutjanus fulgens	1	1		1	37.5	3.042			4.056
Pagellus bellottii	1	5	2		100	1.755	0.174	1.298	2.095
Galeoides decadactylus	1	1	1		37.5	0.816			1.088
Pomadasys incisus	2		1		37.5	0.578			0.771
Decapterus macarellus	2		1		37.5	0.516	0.216		0.652
Acanthurus monroviae			1		12.5	0.51			0.68
Chelonia mydas			1		12.5	0.492	3.933		
Sepia officinalis	8				100	0.316	0.191	0.048	0.381
Dentex canariensis	2	1			37.5	0.313			0.418
Sphyraena sphyraena	3	1			50	0.256	1.685		0.06
Pagrus caeruleostictus	6				75	0.232	0.012	0.393	0.241
Paranthias furcifer	1	1			25	0.189			0.252
Pseudupeneus prayensis	8				100	0.185	0.022	0.097	0.227
Fistularia petimba	6				75	0.184		0.02	0.242
Apsilus fuscus	1	1			25	0.165			0.22
, Epinephelus aeneus	1	1			25	0.162			0.216
Lagocephalus lagocephalus DEAD		1			12.5	0.154	1.236		
Priacanthus arenatus	3				37.5	0.139			0.185
Lethrinus atlanticus	3				37.5	0.092	0.247	0.41	0.014
Decapterus punctatus	4				50	0.078	0.413	0.001	0.035
Acanthostracion guadricornis	2				25	0.072	0.539		0.006
, Svacium micrurum	6				75	0.071		0.002	0.094
Balistes capriscus	2				25	0.064		0.481	0.006
, Carangoides bartholomaei	1				12.5	0.052			0.069
Dentex congoensis	6				75	0.045			0.06
Psettodes belcheri	3				37.5	0.04			0.053
Chilomvcterus spinosus mauret.	6				75	0.039	0.055		0.043
Balistes punctatus	2				25	0.037	0.23	0.064	
Lutianus goreensis	1				12.5	0.032			0.043
Selene dorsalis	3				37.5	0.031			0.042
Seriola carpenteri	4				50	0.028		0.047	0.03
Octopus vulgaris	3				37.5	0.023		0.051	0.023
Bothus auibei	1				12.5	0.023	0.183		
Aluterus heudelotii	3				37.5	0.021	0.057		0.018
Alloteuthis africana	2				25	0.018		0.127	0.003
Citharus linguatula	4				50	0.016		0	0.022
Other fish	-					0.086	0.135	0.031	0.088
Sum all species						15.065	16.916	8.688	15.819
Sum SNAPPERS, JOBFISHES						3.239			4.319
Sum GROUPERS, SEABASSES						0.352			0.469
Sum GRUNTS. SWEETLIPS						0.592			0.789
Sum CROAKERS, DRUMS, WFAK	F KΩ	BS				0.002			000
Sum PANDORAS, PORGIES, SFAI	BREA	MS.				2.359	0.186	1.691	2.832
Sum SHARKS, CHIMAFRAS	/ \	,					000		2.502
Sum BATOID FISHES, RAYS						0.009	0.006		0.012
Sum CEPHALOPODS						0.357	0.191	0.226	0.407
Numbers of stations included in ana	lysis.	total a	and h	y depth	n strata	8	1	1	6

Annex IV Instruments and fishing gear used

The Simrad ER-60 scientific echo sounder connected to 18, 38, 120 and 200 kHz transducers was run during the survey only for observation of fish and bottom conditions. No scrutinizing of the recordings was done.

Last standard sphere calibrations were carried out 07.03.2010 in Baia dos Elefantes. Angola using Cu-64, Cu-60, WC-38.1 add WC-38.1 spheres for 18, 38, 120 and 200 kHz, respectively. The details of the settings of the 38 kHz echo sounder where as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5.50 m
Absorbtion coeff.	8,5 dB/km
Pulse duration	medium (1,024ms)
Bandwidth	2,43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,23 dB
SA correction	-0,51 dB
Angle sensitivity	21.9
3 dB beamwidth	7,35° along ship
	7,31° athwardship
Alongship offset	-0.05°
Athwardship offset	0.06°

Bottom detection menu Minimum level -40 dB

Fishing gear

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". During the present survey only the bottom trawl was used.

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm mesh size in the codend with an inner net of 10 mm mesh size. The trawl height was about 4.5 m and distance between wings during towing about 21 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. Since 19.02.08 new and heavier "Thyborøn" combi trawl doors (7.41 m², 1720 kg) have been in used. During the present survey the door distance was kept nearly constant at about 50 m at all depths by the use of a 9 m strap between the wires at 120 m distance from the doors (normally applied at depths greater than 80 m). At depths greater than 300 m the trawl was equipped with a tickler chain, which improves the catchability of bottom living and borrowing species, particularly shrimps.

The SCANMAR system was used on all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance, and the trawl was equipped with a trawl eye that provides information about the trawl opening. A catch sensor on the cod-end indicated the size of the catch.

Annex V Preliminary report on registrations of *Lagocephalus lagocephalus* die off

INVESTIGATION INTO CAUSE OF MASS MORTALITY OF *LAGOCEPHALUS LAGOCEPHALUS* OFF SÃO TOMÉ – MAY 2010

Introduction and background

The Oceanic pufferfish *Lagocephalus lagocephalus* (Linnaeus, 1758) (locally called Rabbit fish or Rabbit puffer) (Fig. 1) is a widely distributed species of the large family of pufferfishes, the Tetraodontidae. This group is renown for the deadly tetraodoxin poison that permeates the body parts of many species, with some more toxic than others. Several species are highly prized in Japan where they are known as fugu and are served in select high-end restaurants that specialize in this delicacy, and which must be prepared by highly-trained licensed chefs. The Oceanic pufferfish, as its name implies, is primarily pelagic in its habit, but occasionally will stray into inshore waters. Its closely similar relative in eastern Atlantic waters, the Smooth pufferfish *Lagocephalus laevigatus* Linnaeus, 1766, is similar in many characteristics but is commonly in coastal waters, although occasionally found offshore to the edge of the continental shelf at depths approaching 200 m. The Oceanic pufferfish is found off the island of São Tomé where it forms a small artisanal fishery for local consumption.

A mass die-off and strandings of dead Oceanic pufferfish along beaches off São Tomé was reported by residents and biologists of the Ministry of Fisheries beginning around the first part of the month of May. While conducting a survey of the fishery resources of São Tomé and Príncipe for the country's government, scientists aboard the Norwegian fishery research vessel *Dr Fridtjof Nansen* were requested to conduct an investigation as to the possible cause of the phenomenon. During the second week of the survey on the 14/05-2010 at 15:23 while on the southeastern coast of São Tomé, the ship ran across an oceanic front approximately 4 nautical miles off the island at 0°13.8'N, 6°24.2'E. The current boundary appeared to form a line of concentration of dead puffers floating at the surface and readily visible because of their bright white belly (Figure 2). A skiff was launched and five specimens were quickly retrieved and brought to *Dr. Fridtjof Nansen*.



Figure 1. The Oceanic pufferfish, Lagocephalus lagocephalus (photo: O. Alvheim).

Methods and materials

Once aboard the ship, the specimens were quickly examined externally, photographed, and their species identity verified. Two of the five specimens were immediately injected with 75% ethyl alcohol and placed in a container of the alcohol at 50% concentration. Two others were injected with concentrated formalin and then placed into a container with a 10% solution of formalin and water. The fifth specimen was examined closer and sacrificed. Aside from a slightly rotten smell, the specimen appeared to be in reasonably good shape: it is likely that it had not been dead for more than a day or two. A closer examination in the laboratory showed the body muscle mass to be relatively firm, although we had no fresh specimen by which to make a comparison. The gills were still pink and not overlain with mucous, and the eyeballs were relatively clear. Internal dissection revealed a pair of well-developed testes, and some milt was discharged when first handling the fish; the small liver appeared to be that of a healthy animal. No internal parasites were visible in the peritoneal cavity or elsewhere, including the body muscles. There was no outward appearance of physical injury to the fish.

Results and discussion

From our examination we conclude that no direct physical trauma was imposed on the fish nor was there any malignant form of disease or internal parasite as the likely cause of death. Instead, we speculate that other external factors may account for the mass mortality observed off the island, for example, a sudden change in water temperature. Perhaps by coincidence the pufferfish die-off coincides with the annual strandings of large squid along the shores of the west coast of São Tomé, from the city of that name south for a short distance. It is at these times that local citizens wade the surf along the coast and catch by hand dozens of these squid for consumption. The local fishery biologists suggest that these squid strandings are a probable result of spawning aggregations-perhaps typical of many squid species, once spawned, the squid die. Oceanographic conditions off the island are scarcely known, especially on a short temporal basis. We have heard from different sources that the ocean is cooler during the times the squid "come in" to shore. If upwelling events occur that produce cold water over large areas offshore, the Oceanic pufferfish may possibly succumb to the coolness, as the species is primarily confined to oceanic waters with relatively constant (and mild) temperatures. According to our local biologist colleagues, the die-offs have been recorded only since 2007, and quite regularly at the same time of the year from March-May. Could this reflect longer-term oceanic changes that are taking place and affecting biological conditions around the island?

Other possible causes to be explored include pollution from local or external sources. Because of the tiny industrial component of the islands' economy and relatively benign agricultural component, with commercial export crops primarily cacao, palm oil, and coffee, local run-off from these sources seem unlikely pollutants that could affect oceanic fishes. The large oilproducing countries off West Africa, especially Angola and Nigeria, are so far removed from these oceanic islands as to belie any reasonable scenario that would explain how pollutants could affect the island waters to a major degree.

Poisonous "red tides" were also not observed in the surveyed area and CTD samples of the water column at the place where the dead fish were found as well as around other parts of the island did not reveal any oceanic conditions like hypoxic water masses that may have explained the phenomena. However, the water temperature was slightly higher than observed during previous surveys in the same area.

It is noteworthy that similar die-offs of Oceanic pufferfish, but on a much wider scale, have been observed on the shelf (up to 40 NM off the coast) off Gabon to northern Angola (01°00' S - 05°00') over a period of several days by one of us (JK) in mid May 2008. The collected dead or dying fish were in similar fine condition as that described during the current event.

No seismic activity, no visible pollution, and no "red tide" or similar algal bloom were observed during the May 2008 survey. The water masses were well saturated with oxygen, while water temperature in the region was higher than average. Samples of the fish sent for analyses at laboratories at the Institute of Marine Research in Norway did not reveal the cause of death.

Massive die-offs of pufferfishes off Angola have also been observed by another one of us (OA) over a period of more than 12 years of working along that and the Namibia coast aboard *Dr. Fridtjof Nansen*.

A currently existing oceanographic condition off the island could offer the key to an answer: a temperature-salinity anomaly was registered by *Dr. Fridtjof Nansen* during its transit from Accra to the islands and in the ship's tracks around the islands over the course of the survey (Figs. 2 & 3).



Figure 2. Surface water temperatures around São Tomé and Príncipe. Red dots depict stations where dead Lagocephalus lagocephalus was encountered.



Figure 3. Surface water salitity around São Tomé and Príncipe.

It appears that a decidedly warmer (27°C-30°C) and less saline (<33-35‰) water mass baths the surface waters off Príncipe: the origin of this water mass is likely from the mainland coast of the Gulf of Guinea where large rivers discharge their loads. On the other hand, São Tomé is engulfed by cool, (22-28°C) higher-salinity (34-36‰) waters that originate from the south, with a sharp thermal front developed along the southeastern coast, perhaps a result of local upwelling.

Conclusion

We are left with no viable explanation for the recent massive die-off of Oceanic pufferfish off the island of São Tomé. At best, we can hope that oceanic observations made during the current, past, and future surveys may offer some explanation for the phenomenon. Long-term investigations and monitoring of oceanographic conditions by local scientists are vital components of the effort needed to eventually answer this question. In this regard, we have yet to access sea-surface temperature data off São Tomé that are available at the Ministry of Fisheries, similarly, meterological data for upwelling indexes over the previous 10 years are critical to understanding long-term changes in the water masses around the island. Perhaps answers to the causes of similar die-offs in other countries in mainland Africa will be applicable in São Tomé. That the die-off only affected one oceanic species of minor commercial importance is a positive side of this phenomenon. And that aspect —one oceanic species--should be pursued, as it may offer an explanation. At present, there is almost no information on the life history of the species, a crucial question that also needs to be addressed.

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